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REVIEW
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VOL. XXXVI FEBRUARY 1957

Literature references in [ ] refer to the *Review of Applied Mycology*,
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ABE (T.) & KONO (M.). **Studies on the white root-rot of Tea bush. III. On the effect of the components of culture media to the fungal growth, and the phytotoxicity of the filtrate of liquid media used by the fungus.**—*Sci. Rep. Fac. Agric. Saikyo Univ.* 7, pp. 49–56, 1955.

In this further contribution [cf. 35, p. 330] the cultural characteristics of the three isolates of *Rosellinia* [*necatrix*: loc. cit.] are described. The phytotoxic properties of culture media in which these isolates had grown were tested; on broad bean cuttings symptoms similar to those caused by *Cercospora fabae* were induced, while tea seedlings developed a wilt similar to that following inoculation with *R. necatrix*.

ABE (T.) & KONO (M.). **Studies on the anthracnose of Tea bush. I. Healthy Tea leaves as a carrier of anthracnose fungi, and the ascigerous stage of the fungi.** —*Sci. Rep. Fac. Agric. Saikyo Univ.* 7, pp. 95–102, 2 pl., 1 fig., 5 graphs, 1955. [Japanese, with English summary.]

Three species of fungi were isolated from apparently healthy tea leaves at Saikyo University, Kyoto, Japan. *Glomerella cingulata*, the agent of brown blight, was most abundant in spring, and *Guignardia camelliae* in summer and winter. On varieties resistant to brown blight *Glomerella cingulata* showed a high degree of latent infection while *Guignardia camelliae* was less common than on susceptible varieties. Perithecia of *Glomerella cingulata* were formed after one month on potato extract agar, and more rapidly following ultra-violet irradiation. The perfect states of an unidentified *Glomerella* and of *Guignardia camelliae* were obtained by inoculating sterilized tea leaves.

Proceedings of the Fourth Annual Conference of the Scientific Department of the United Planters' Association of Southern India, 1956.—*Bull. unit. Plant. Ass. S. India* 15, 60 pp., 2 diags., 1956.

In a paper on the laboratory evaluation of fungicides (pp. 2–13) P. de JONG reported on the continuation of work alluded to in previous conferences [35, p. 238]. During 1954, 26 wettable copper formulations were examined and subsequently methods have been sought for rapid laboratory tests of their efficacy against blister blight [*Exobasidium vexans*] on tea. Tables are given of the rates of sedimentation and the adhesive qualities of the formulations examined. The former property varied little between the 25 fungicides investigated; the latter was tested by treating standard samples of leaves with known quantities of spray, allowing them to dry for four hours, washing them for five minutes, and then determining the percentage of copper remaining on the leaves by microanalysis.

The ED 95 values of 11 of the fungicides were just over 1 μgm./sq.cm. glass slide, and that of colloidal copper was 0·912. The fungicidal efficiency was, as a rule, reduced only slightly by washing, Shell copper fungicide and colloidal copper for example being 98 per cent. as efficient, and fytolan 86 per cent. In one instance laboratory tests belied field performance, perenox showing a low estimated tenacity value and moderate ED values, and yet being very efficient in use. From field tests 20 of the test fungicides were found suitable for the control of *E. vexans*.

During the 1955 south-west monsoon season a colloidal copper formulation, containing 15 per cent. metallic copper and another (colloidox) containing 20 applied at equivalent weights gave as good control of *E. vexans* as wettable coppers containing 50 per cent. metallic copper. The control of blister blight might, therefore, be achieved by the use of a greatly reduced amount of copper in more efficient formulations than are now in use.

In a paper summarizing work on pathology, physiology and propagation (pp. 27–34) K. S. Venkataramani noted the occurrence of two distinct physiologic races of *E. vexans*, the infection of a resistant tea clone furnishing the first definite evidence of physiologic specialization in this pathogen.

Wüstinger (G.), Broda (E.), & Schönfellinger (H.). **Optimale Bedingungen für die Gewinnung von radioaktivem Tabakmosaikvirus.** [Optimal conditions for the production of radio-active Tobacco mosaic virus.]—*Mh. Chem.*, 86, 1, pp. 131–136, 1955.

In continuation of previous work [35, p. 640] the authors investigated the optimum 'infection age' (i.e., the interval between infection and radiophotosynthesis) for tobacco mosaic virus-infected tobacco leaves given radioactive carbon dioxide to be used in the production of labelled virus. Six to ten days was the optimum 'infection age' for specific activity (activity per unit weight), which fell off rapidly after this. High total yields are reported for 'infection ages' of four to 11 weeks, though earlier than this they were much lower. Labelled virus was also obtained from infected leaves infiltrated with labelled glucose and kept in the dark. The incorporation of carbon into the virus is thus not necessarily associated with photosynthesis.

Humphries (E. C.) & Kassanis (B.). **Effects of darkness on the constitution of Tobacco leaves and susceptibility to virus infection.**—*Ann. appl. Biol.*, 43, 4, pp. 686–695, 3 graphs, 1955.

Much of this work at Rothamsted Experimental Station on the cause of the increased susceptibility to tomato aucuba virus infection shown by tobacco plants kept in darkness has already been noticed [35, p. 345]. Of the various nitrogen fractions determined, only nitrate appeared to be closely correlated with susceptibility, but the evidence suggested that this correlation was indirect, not causal. The correlation established between susceptibility and increase in water content is compatible with the hypothesis that osmotic pressure and turgor may influence the establishment and multiplication of the virus [cf. 33, p. 583]. There would appear to be a relationship between water content and protein synthesis comparable with the association between water content and susceptibility of the leaf to virus infection.

Commoner (B.) & Rodenberg (S. D.). **Relationships between Tobacco mosaic virus and the non-virus proteins.**—*J. gen. Physiol.*, 38, 4, pp. 475–492, 9 graphs, 1955.

At the Henry Shaw School of Botany, Washington University, St. Louis, the non-virus proteins A4, B3, and B6 found in tobacco infected by tobacco mosaic

virus [33, p. 265; cf. 35, p. 794] exhibited specific immunochemical cross-reactions with serum prepared against the virus, such as do not occur with normal tobacco leaf proteins. The non-virus proteins appear abruptly some 220 hours after inoculation, when the virus content of the leaf is about a third of its final value. A4 increases rapidly, then levels off; B6 increases rapidly and continuously; B3 appears last and increases more slowly. Comparison of the isotope contents of tobacco mosaic virus, B3, and B6 in leaves supplied with N^{15}-labelled nutrient suggests that the virus and non-virus proteins are synthesized at the same time from the same non-protein nitrogen source.

It is possible that one or more of the non-virus proteins represents small protein units occurring in the tobacco mosaic virus nucleoprotein. In the infected leaf, the non-virus proteins are probably no longer available for synthesis of tobacco mosaic virus.

HOLMES (F. O.). **Preventive and curative effects of thiouracil treatments in mosaic-hypersensitive Tobacco.**—*Virology*, 1, 1, pp. 1–9, 3 figs., 1955.

At the Rockefeller Institute for Medical Research, New York, four or ten to 12 daily additions of 5 mg. of thiouracil (50 ml. of 0·01 per cent. solution) as a soil drench to tobacco plants infected with tobacco mosaic virus [cf. 34, p. 702] and carrying the gene *N* for hypersensitivity increased resistance to both local and systemic infection. Applications begun before or immediately after local lesions appeared prevented stunting, and generally cured the plants. Treatments lasting seven to nine days were not quite so effective as those of shorter or longer duration. Plants treated after the development of systemic disease were less responsive, but partial improvement was noted in some cases.

YOSHII (H.), YOZAN (T.), & NONAKA (F.). **Accumulation of radioactive phosphorus-32 or sulphur-35 in lesions of Tobacco anthracnose.**—*Sci. Bull. Fac. Agric. Kyushu*, 15, 2, pp. 139–144, 5 figs., 1955. [Japanese, with English summary.]

Accumulation of radio-active phosphorus-32 in lesions of tobacco anthracnose (*Colletotrichum* sp.) at Kyushu University, Japan, occurred more rapidly than that of sulphur-35 [cf. 36, p. 51]. The accumulation of phosphorus-32 was classified into three types, spot, simple ring, and concentric. There was no correlation between the appearance of the lesions and these types.

FRAENKEL-CONRAT (H.). **Rebuilding a virus.**—*Sci. Amer.*, 194, 6, pp. 42–47, 4 figs., 5 diags., 1956.

The latest information derived from studies at the Virus Laboratory, University of California, Berkeley, on the composition and structure of the tobacco mosaic virus is presented in language intelligible to the non-specialist. Reference to the work in question has been made from time to time in this *Review*. It is concluded that the investigations have 'launched a new chemical approach to studies of virus disease, of the organization of biologically active matter, and of the mechanism of inheritance'.

RICHARDSON (R. W.) & BRAUER H. (O.). **El Tomate. Indicaciones generales para su cultivo.** [The Tomato General directions for cultivation.]—*Foll. Divulg. Progr. agric. Co-op. Secret. Agric. Ganad. Méx.* 17, 27 pp., 8 figs., 1955. [English summary.]

The control of nursery and field diseases of tomato in Mexico is discussed on pp. 18–22 of this publication. For the nursery it is recommended that preventive spraying against damping-off (*Pythium* spp. and *Rhizoctonia* [*Corticium*] *solani*)

should be effected with 5 teaspoons of arasan or 2½ of semesan, against early blight (*Alternaria solani*) with 18 gm. of yellow oxide of copper or 24 of zerlate, and against late blight (*Phytophthora infestans*) [31, p. 372] with 25 gm. of metallic copper or dithane Z-78, all amounts being per 10 l. of water, sufficient to spray 10 sq. m., and to be repeated at 7- or 10-day intervals.

Field spraying against early and late blights at similar intervals should begin with flowering (or before, if conditions favour disease development). The copper content of insoluble copper compounds may vary from 25 to 85 per cent.; they should be applied at 2 kg. copper per 800 l. of water per ha., or organic fungicides may be substituted. *Fusarium* wilts (*Fusarium* spp.) [? *F. bulbigenum* var. *lycopersici*] are controlled by crop rotation and the use of resistant varieties. Virus diseases [unspecified] probably cause greater losses to tomato in Mexico than to any other crop.

Prieto Ruiz (R.). **Planteamiento del problema de la 'degeneración' del Tomate en los valles de Aragua, Venezuela.** [Discussion of the problem of 'degeneration' of Tomato in the valleys of Aragua, Venezuela.]—*Agron. trop., Maracay*, 4, 4, pp. 185–191, 1 diag., 1955. [English summary.]

Degeneration of tomato in the Maracay region of Aragua, which has been observed in the varieties Marglobe, Rutgers, and Pan America, is characterized by a decrease in the size of fruit grown from seed harvested in the same region. Seed imported, or harvested at Sanare (altitude 1,350 m.), yielded normal fruit at Maracay (445 m.), and seed harvested at Maracay produced normal fruit at Sanare. The phenomenon is considered to be due to the low night temperatures of the Maracay region rather than to a virus.

In addition a vernalization or hormonal phenomenon is noted in seed harvested at Sanare, or imported. Hormoneless seed harvested at Maracay produced normal fruit when grown at Sanare, indicating that the plant can recover its normal hormone content during the vegetative period if night temperatures are favourable. It is thus necessary to determine the period of development sensitive to vernalization. A genetic solution, based on the reaction of different varieties to night temperatures, is being sought.

Scheffer (R. P.), Gothoskar (S. S.), Pierson (C. F.), & Collins (R. P.). **Physiological aspects of Verticillium wilt.**—*Phytopathology*, 46, 2, pp. 83–87, 1 fig., 3 graphs, 1956.

The results of this joint study from the Department of Botany and Plant Pathology, Michigan State University, and the Departments of Biochemistry and Plant Pathology, University of Wisconsin, showed that transpiration was inhibited before and during symptom expression in Bonny Best tomato plants inoculated with *Verticillium albo-atrum* [34, p. 111]. The occurrence of vascular dysfunction in the form of browning and occlusion denoted that wilting resulted from interference with water conduction [cf. 34, p. 266]. Culture fluids of the fungus contained a heat-labile factor for vascular browning. Assays for pectic enzyme activity revealed a polygalacturonase and very little, if any, pectin methyl esterase, differing in this respect from *Fusarium* [*bulbigenum* var. *lycopersici*: 35, p. 334], a more virulent pathogen of tomato.

Gigante (R.). **Occurrence of bushy stunt of Tomato in Italy.**—*F.A.O. Pl. Prot. Bull.*, 3, 11, pp. 170–171, 1 fig., 1955.

The information in this paper has already been noted from another source [35, p. 493].

KAHN (R. P.). **Seed transmission of the Tomato-ringspot virus in the Lincoln variety of Soybeans.**—*Phytopathology*, 46, 5, p. 295, 1956.

In further experiments at Camp Detrick, Frederick, Maryland, positive results were again secured in the transmission of the tobacco ring spot virus through Lincoln soy-bean seed [33, p. 699], 82 per cent. of 22 seedlings contracting infection from this source. For the first time, Price's isolate of tomato ring spot virus [35, p. 50] was also transmitted in the same way to 76 per cent. of 34 seedlings.

ADSUAR (J.). **A report on two species of Tomato resistant to the Tomato disease known as 'tisis' in Puerto Rico.**—*J. Agric. Univ. P.R.*, 40, 2, pp. 127–128, 1956.

In trials of *Lycopersicum* species to assess resistance to the virus disease known as 'tisis' in Puerto Rico [35, p. 401] both *L. hirsutum* and *L. glabratum* proved susceptible when grafted as scions or stocks to infected Marglobe tomatoes, but *L. peruvianum* var. *dentatum* and *L. glandulosum*, though difficult to graft, grew without symptoms when the grafts did take, and appear resistant to the disease.

RAHM (E.). **Hallimasch, ein gefährlicher Parasit in unseren Wäldern.** [The honey fungus, a dangerous parasite in our forests.]—*Schweiz. Z. Forstw.*, 107, 1, pp. 8–17, 1 fig., 1956. [French summary.]

Useful information is presented on various aspects of *Armillaria mellea*, a formidable pathogen of forest trees in Switzerland, including the functions of the mycelium and rhizomorphs [cf. 35, p. 800], luminosity, edibility, geographical distribution, artificial culture, physiologic specialization, nomenclature, and control. The following species, besides the particularly susceptible spruce, are hosts of the fungus at an altitude of 1,700 to 2,000 m. in the Arosa district: alder, willow [*Salix* spp.], Scots and stone pines, larch, mountain ash [*Sorbus aucuparia*], birch, sycamore [*Acer pseudoplatanus*], and *Lonicera xylosteum*; infection has also been observed on *Eryngium alpinum* on a street wall. The most promising methods of control are the selection of species appropriate for cultivation in a particular habitat and eradication and burning of infected stumps.

Annual Report of the Forest Insect and Disease Survey, Canada Department of Agriculture, 1955.—106 pp., 17 maps, 1956.

In the section of this report [cf. 34, p. 680] covering the forest disease survey of the Atlantic Provinces, Canada (pp. 24–26), A. G. DAVIDSON notes severe defoliation of elms in Liverpool, Nova Scotia, by *Phleospora ulmi* [34, p. 629], the imperfect state of *Mycosphaerella ulmi*. Some damage to elm foliage was also caused by *Gnomonia ulmea* [32, p. 649] in St. Stephen, New Brunswick. Ash rust (*Puccinia sparganiodes*) was again severe in southwestern Nova Scotia and red oak [*Quercus spp.*] in central and southern New Brunswick was heavily infected by *Taphrina coerulescens* [34, p. 115]. Needle cast, mainly attributable to *Bifusella faullii* [32, p. 519], commonly affected young balsam fir [*Abies balsamea*] in Nova Scotia, Prince Edward Island, and New Brunswick, and in the last-named area a tip blight of *A. balsamea* similar to that caused by *Rehmiellopsis balsameae* [28, p. 6] was noted but the fungus was not found. The spruce rust on the Avalon peninsula, Newfoundland [34, p. 681], was caused by both *Chrysomyxa ledicola* and *C. empetri* [33, p. 450]. *Ciborinia whetzelii* [35, p. 404] causing inkspot of aspen occurred commonly in New Brunswick.

R. POMERLEAU reports from Quebec (pp. 32–34) that Dutch elm disease [*Ceratostomella ulmi*: 34, p. 411] is still on the increase. The fungi most commonly isolated from decayed wood of *A. balsamea* and red spruce [*Picea rubens*] were *Stereum sanguinolentum* and *Corticium galactinium*, also *Fomes pini* from the last named. In a white spruce [*Picea glauca*] plantation heavily attacked by needle

rust (*Chrysomyxa ledicola*) one black spruce [*P. mariana*] was not infected. On Anticosti island *A. balsamea* was abnormally broomed by *Melampsorella cerastii* [33, p. 184].

H. H. V. Hord and D. A. Quirke, reporting on the survey in Ontario (pp. 56–69), state that collections of *F. igniarius* were made throughout the range of hardwoods in the province. *Armillaria mellea* occurs in all forested areas [cf. 35, p. 799]. Canker and dieback of *Abies balsamea* [loc. cit.] were most frequent on physiologically dry sites; a fungus of the *Nectria* complex was abundant on the dead tissue and *Armillaria mellea* was often found on the roots of affected trees. Dutch elm disease, scarce in the east, where *Hylurgopinus rufipes* is the only known vector, is more common in the west, where the vector *Scolytus multistriatus* occurs, and was newly reported from Hamilton. *F. annosus* [34, p. 196] was collected twice on red pine, the first records in Ontario. *Coniophora puteana* [34, pp. 195, 414, 419] was associated with heart rot of living trees of eastern white cedar [*Thuja occidentalis*] and was also identified from white spruce. The following fungi causing decay in dead wood have been collected and their damage studied:—*F. fomentarius* [32, p. 519], *F. pinicola* [34, p. 197], *Polyporus* [*Polystictus*] *abietinus* [34, p. 819], *Polyporus pargamenus* [loc. cit.], and *Lenzites saepiaria* [loc. cit.]. The incidence of white pine blister rust (*Cronartium ribicola*) [35, pp. 335, 336] ranged from 16 to 33·6 per cent. in the plots examined. Sweet fern blister rust (*C. comptoniae*) [30, p. 351] was commonly encountered on jack pine [*P. banksiana*]. *Coleosporium solidaginis* [loc. cit.], causing needle rust of jack and red pine, was most prevalent in the northern counties. Shoot blight of aspen caused by *Fusicladium radiosum* [*Didymosphaeria populina*: 31, p. 39] was more prevalent than usual in some western districts. In a number of districts a deterioration of white birch (*Betula papyrifera*) was noted, involving a die-back of branch tips and sometimes of the whole crown, and that of yellow birch (*B. lutea*) was again on the increase [cf. 35, p. 130].

H. Zalasky reports from Manitoba and Saskatchewan (p. 82) that *Wallrothiella arceuthobii* [cf. 35, p. 335] was quite common in some areas in mixed wood forests on jack pine mistletoe (*Arceuthobium americanum*). Red ring rot of conifers [*Fomes pini*] was observed on black spruce from the Hatchet and Reindeer lakes in northern Saskatchewan and white trunk rot of poplar (*F. igniarius*) has now been found as far north as Deschambault lake.

In the report from Alberta (pp. 89–91) R. J. Bourchier notes severe outbreaks of spruce needle rust (*Chrysomyxa ledicola*) in the Lac La Biche-Philomena area, and westward, near Smith and Spurfield, but elsewhere incidence was less than in the previous year. Further observations on the two outbreaks of *Atropellis piniphila* on lodgepole pine [*Pinus contorta* var. *latifolia*: 34, p. 682] indicated an area of 125 square miles to be heavily infected (70 per cent. or more of the trees attacked), some 180 square miles around this having 40 to 70 per cent. infection. The disease was also noted in other areas, but the parasite appears to be relatively inactive. Needle cast of lodgepole pine due to *Hypodermella montivaga* [loc. cit.] was again present in epidemic proportions; the attack was heaviest on the 1954 foliage, no fruit bodies being found on that of 1955.

A. C. Molnar, reporting from British Columbia (pp. 102–106), notes a lessening of needle cast diseases in comparison with the previous year, though needle rusts were more severe, notably *C. ledicola* on spruce in the northern part of the Province, and *Pucciniastrum epilobii* [28, p. 201] on alpine fir [*Abies lasiocarpa*]. Near Courtenay, Vancouver Island, on young Douglas fir [*Pseudotsuga taxifolia*] there was a close association of basal fire scars, caused 83 and 59 years previously, with brown cubical butt rots, mostly caused by *Polyporus schweinitzii* [34, p. 197], and in a few cases by *P. balsameus* [34, p. 414], the latter a new record on this host in the area. Root rot due to *Armillaria mellea* causes light but persistent damage to Douglas fir and other species on Vancouver Island.

Fernandes (C. T.). **A Secção de Estudos do Castanheiro e a actividade nela desenvolvida em 1954.** [The Section of Studies of the Chestnut and the progress of the work therein during 1954.]—*Estud. Inform. Serv. Flor. aqüic.* 55–C2, 8 pp., 2 figs., 1955.

Laboratory studies on the control of chestnut ink disease [cf. 29, p. 390; 34, p. 759] as part of the campaign for the cultivation, development, protection, and rehabilitation of the Portuguese chestnut forests in 1954 involved the inoculation with *Phytophthora cinnamomi* of 223 seedlings, of which 126 (55·5 per cent.) reacted positively, including 71 (53 per cent.) of the 134 hybrids between *Castanea sativa* and *C. crenata* comprised in the tests. Positive results were also obtained, e.g., on six out of 22 (27 per cent.) *C. mollissima*, nine out of 14 (64) hybrids × *C. sativa*, eight out of 10 (80) *C. crenata* × *C. crenata*, and eight out of nine (80), seven out of eight (87·5), and five out of five (100), respectively, of the Martainha, Lada, and Verdeal varieties of *C. sativa*. Within the *C. sativa* × *C. crenata* group were 24 resistant individuals and 39 which contracted only local necroses, the corresponding figures for *C. mollissima* being nine and seven, respectively. The sum-totals of resistant and quasi-resistant individuals were 44 and 53, respectively.

In another series of experiments during the same period 40 seedlings previously inoculated with *P. cambivora* were inoculated with *P. cinnamomi*, while 228 previously inoculated with the latter species were inoculated with the former. *P. cinnamomi* infected 16 (40 per cent.) and caused the development of localized necroses on 11, leaving only 13 resistant, the corresponding figures for *P. cambivora* being 120 (52·6), 74, and 34, respectively.

At concentrations exceeding 1 in 100,000, solutions of copper sulphate and colloidal copper inhibited the mycelial growth of isolates R and CS 1 of *P. cinnamomi* on carrot agar, while B and F 27 of *P. cambivora* on the same medium succumbed to the two compounds at a strength of 1 in 200,000. Very encouraging results have been secured in field tests by the application to the soil through a deep trench of a mixture of copper carbonate, copper oxide, and gypsum in the proportions of 2–1–2, as well as with the two latter components in equal parts. Trees treated by this method in 1951 presented a healthy appearance on inspection in 1954 [loc. cit.].

Strong (F. C.), Janes (R. L.), & Morofsky (W. F.). **Dutch Elm disease control.** —*Ext. Folder Mich. St. Coll.* F–195, 10 pp., 5 figs., 1955.

Popular notes are given on the control of the vector (*Scolytus multistriatus*) of Dutch elm disease (*Ceratostomella ulmi*) [see next abstract] with particular reference to Michigan.

Gram (E.). **Outbreaks and new records. Denmark.**—*F.A.O. Pl. Prot. Bull.*, 4, 1, p. 13, 1955.

The discovery of Dutch elm disease (*Ceratostomella ulmi*) [map 36] in North Zealand, Denmark, is reported.

Jewell (F. F.). **Insect transmission of Oak wilt.**—*Phytopathology*, 46, 5, pp. 244–257, 17 figs., 1 diag., 1956.

Further information is presented on the transmission of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*] in West Virginia during 1953 and 1954 by the four species of Nitidulidae mentioned in previous reports [cf. 34, p. 757]. Constantly associated with the beetles in wounds in healthy trees were *Graphium rigidum* and *Ophiostoma* [*Ceratocystis*] *pluriannulata*, which served as a source of food. Many of the wounds contained nitulid eggs and larvae, and evidence was obtained that pupation of *Colopterus morio*, *C. semitectus*, and probably other species occurs in the litter at the base of injured trees. The results of inoculation experiments in

April with spore suspensions of the oak wilt fungus demonstrated the utilization of infested wounds as infection courts.

By means of a spermatization technique based on the observation of Leach *et al.* [32, p. 596] that nitidulids carry spores of *Chalara quercina* from a mycelial mat of one compatibility type to a mat of the opposite type, the fungus was demonstrated in the faecal pellets of several species. Suspended in sterilized water, pellets from culture-fed beetles proved effective as inoculum when injected into fresh wounds. The spermatization method was also useful for the detection of *C. quercina* in mixed fungal cultures.

An apparently symbiotic relationship was shown to exist between the Nitidulae, *G. rigidum*, and *Ceratocystis pluriannulata*, the fungi being disseminated by the beetles and supplying them with nutriment in return. It is postulated that the two foregoing species are the original fungus members of the partnership, the oak wilt pathogen being a relatively recent acquisition. If this hypothesis is correct, the association with *Chalara quercina* may be expected to become more general with the passage of time, resulting in a corresponding increase in rate of spread of the disease.

Campbell (R. N.) & French (D. W.). **Moisture content of Oaks and mat formation by the Oak wilt fungus.**—*For. Sci.*, 1, 4, pp. 265–270, 1955. [Received September, 1956.]

From October, 1953, to April, 1955, inclusive, moisture content determinations were made at the University of Minnesota, St. Paul, on 31 healthy northern pin oaks (*Quercus ellipsoidalis*) and on 29 trees of the same species infected by *Endoconidiophora fagacearum* [*Chalara quercina*: 35, p. 729]. In healthy trees the moisture content of the sapwood averaged 45·6 per cent. during the period of radial growth, falling to 40 per cent. for the rest of the year. In wilted trees it remained for some time at the higher level, probably because of plugging of the vessels. Most wilting occurred during the growing period. Mat formation was at its highest while the sapwood moisture level was high, i.e., in trees wilting and reaching the mat-bearing stage in the same year. When mats were not formed until the following spring the level was much lower (41 per cent.). The poor mat formation observed on trees that wilted in September [cf. 35, p. 248] may, therefore, be due to the low moisture content in September and to the drying out of wilted trees during the winter. Felling or deep girdling [35, p. 54] may reduce the moisture content below that suitable for mat formation before the trees reach the mat-producing stage.

Hallemans (A.). **Schorsbrand bij Populieren.** [Bark blight of Poplars.]—*Cult. en Hand.*, 22, 3, pp. 63–65, 1 fig., 1956.

During the winter of 1954–5 *Dothichiza populea* was again responsible for heavy losses in poplar nurseries in the Netherlands [30, p. 293]. Control measures should include rigorous selection of sound material for cuttings, which should be dipped before planting in a copper-containing mixture, e.g., 1 per cent. Bordeaux or copper oxychloride (50 per cent. copper), followed by spraying with the same materials (the former at 1 and the latter at 0·5 per cent.), once in April and twice during July to August, at an interval of three to four weeks at the longest.

Igmándy (Z.). **A kétalakú taplo (Fomes obliquus (Pers.) Fries) károsítása elegyetlen oserállományban.** [Injuries to pure stands of Turkey Oak caused by *Fomes obliquus* (Pers.) Fries.]—*Erdőmernöki Főiskola Évkönyve*, 15, pp. 93–106, 1953. [Abstracted from a German summary. Received August, 1956.]

Fomes obliquus is stated to be the most serious parasite of Turkey oak (*Quercus cerris*) stands in Hungary [22, p. 157], causing a white rot of the heartwood. Initially knobby fructifications, bearing chlamydospores on their surface, occur on the

stems and on stubs. As decay proceeds, hymenia are formed in the resulting cavities. Other oak species are seldom attacked. In the area of Forest Management, Györ, 30 to 44·4 per cent. of the trees in 52-year-old stands of Turkey oak were infected, 62·5 to 71·1 of these yielding one, 19·8 to 26·8 two, and 9·1 to 10·7 per cent. more than two fungal fructifications on parts of the stem used for timber. Stubs of broken branches appear to be the usual infection and fructification sites. The general loss of timber in the area investigated amounted to an average of 10 per cent., though in individual trees it may amount to 25 per cent.

Davidson (R. W.) & Hinds (T. E.). **Hypoxylon canker of Aspen in Colorado.**—*Plant Dis. Reptr*, 40, 2, pp. 157–158, 1 fig., 1956.

The occurrence of *Hypoxylon* canker (*H. pruinatum*) on aspen (*Populus tremuloides*) [34, p. 192] in Colorado [cf. 17, p. 491] was first observed by the authors in June, 1955, in the Routt National Forest, north of Hayden. The disease has since been noticed some 20 miles north of Durango.

Cole (J. R.) & Gossard (A. C.). **Stuart Pecan found to be susceptible to scab in Mississippi.**—*Plant Dis. Reptr*, 40, 2, p. 156, 1956.

Pecan scab (*Cladosporium effusum*) [34, p. 598; 35, p. 511] is reported to be causing damage of economic importance on the hitherto resistant variety Stuart [cf. 8, p. 585] at Laurel and Lumberton in south-eastern Mississippi. The disease is confined to the nuts. If left unchecked the new strain of the fungus may spread rapidly both eastward and westward. Spraying and destroying the old pecan shucks are recommended. Nursery stock and scion wood should not be transported to areas where Stuart is still free from the disease.

Lückhoff (H. A.). **Two hitherto unrecorded fungal diseases attacking Pines and Eucalypts in South Africa,**—*J. S. Afr. For. Ass.* 26, pp. 47–61, 10 pl., 1955.

South African forestry has hitherto escaped serious fungus diseases in plantations of exotic trees [cf. 16, pp. 783, 787]. The author now reports infection of *Pinus taeda* by *Stereum sanguinolentum* [34, p. 185], causing extensive root and stem rot. So far the disease, which has not caused serious damage and which is spreading but slowly, is confined to the Laings Nek plantation, Natal, where it was originally noticed in 1948, the first fructifications appearing four years later on living trees with extensive stem rot. Infected stands are being felled and planted with other species.

Of considerable importance is an outbreak of *Ganoderma colossus*, affecting an otherwise highly promising trial plantation of *Pinus hondurensis*, established at Dukuduku on the Zululand coast in 1929. In the two years prior to writing the disease had spread rapidly, causing extensive root and collar rot in affected trees, which either blow over or die standing. An extensive tract of two- to three-year-old trees nearby is as yet unaffected. The fungus is also attacking *Callitris robusta* and several *Eucalyptus* spp. in the district, including *E. citriodora*, *E. maculata*, *E. punctata*, and *E. paniculata*. These are killed by damage to the root system, and advanced decay has not been observed. Control measures are at present limited to felling, grubbing out of infected stumps, and burning.

Grasso (V.) & Capretti (C.). **Un nuovo ospite di Keithia tetraspora (Phill.) Sacc. e prima segnalazione in Italia.** [A new host of *Keithia tetraspora* (Phill.) Sacc. and the first record in Italy.]—*Ital. for. mont.*, 10, 6, pp. 273–275, 1 pl., 1955. [French summary.]

In April, 1954, *Keithia tetraspora*, not previously recorded from Italy, was isolated from pustules on the upper surface of the leaves of *Juniperus macrocarpa*

trees growing near Quercianella and Cecina, Leghorn. This species appears to be a new host for the fungus.

A short list of conifer species reported to have been infected by *Keithia* spp. in various countries is given, and a bibliography of 31 titles is appended.

Murray (J. S.) & Young (C. W. T.). **The effect of brashing and thinning debris on the incidence of Lophodermium pinastri.**—*Quart. J. For.*, 50, 1, pp. 75–76, 1956.

Heavy infection of Scots pine and Corsican pine [*Pinus nigra* var. *calabrica*] by *Lophodermium pinastri* [32, p. 350] in Britain after the wet summer of 1954 was found to be associated with trimming. Young plantations adjoining older plantings that had been thinned were badly attacked along the adjacent edge of the plantation, but rarely for more than 10 yds. in. The damage to the younger trees was severe but only the lower branches of older trees were affected. In general good recovery was made.

Biraghi (A.). **Occurrence of Thyriopsis halepensis on Pine in Italy.**—*F.A.O. Pl. Prot. Bull.*, 4, 3, pp. 38–40, 2 figs., 1955.

A small stand of Aleppo pine (*Pinus halepensis*) near the sea in Tuscany, Italy, showed considerable defoliation of the lower branches and some die-back, the foliage having been parasitized by *Thyriopsis halepensis*. On a neighbouring stand of *P. pinea* the fungus was also found, but only as a saprophyte on dead needles.

Slipp (A. W.). **Survival probability and its application to damage survey in Western White Pine infected with blister rust.**—*Res. Notes For. Exp. Sta., Univ. Idaho* 7, 13 pp., 1953. [Mimeographed. Received 1956.]

In a study of the probability of survival of western white pine (*Pinus monticola*) in Idaho after infection by blister rust (*Cronartium ribicola*) [cf. 34, p. 826; 35, p. 647] a series of inoculations were made from 1938 to 1942, and 1,304 cankers on 477 branches, together with 45 originating on trunks, were subsequently kept under observation. Only cankers originating within 24 in. were liable to reach the trunk, and the probability of its survival can be gauged on this basis.

Imai (S.), Takei (T.), & Ishikawa (T.). **Studies on the control of damping-off of coniferous seedlings in Hokkaido.**—Reprinted from Jubilee Publication in commemoration of the sixtieth birthdays of Prof. Tochinai and Prof. Fukushi, pp. 145–152, 1955. [Japanese summary.]

Damping-off of seedlings of *Abies* [*sachalinensis* var.] *mayriana* at Asahigawa, Hokkaido, Japan, yielded isolates of *Rhizoctonia* [*Corticium*] *solani*, *Botrytis* sp. (of the *B. cinerea* group), and *Fusarium* spp. [cf. 35, p. 731]. Satisfactory control was obtained with sulphuric acid, 40 ml. per sq. m. diluted with 150 volumes water and applied to the soil in the autumn immediately after sowing, or by dusting the seed with mercron or neomercron at 3 per cent. of seed weight. Chemical treatment of seed-beds in the spring at germination is unsatisfactory unless ample water is available, although uspulun gave some control. Seed kept for a year should be treated at sowing time.

Lyr (H.). **Untersuchungen zur Pathologie der Douglasie.** [Studies on the pathology of the Douglas Fir.]—*Arch. Forstw.*, 4, 5–6, pp. 533–544, 3 graphs, 1 map, 1955.

The studies now in progress at the Institute for Forest Botany, Eberswalde, Germany, on the two principal pathogens of Douglas fir [*Pseudotsuga taxifolia*], namely, *Rhabdocline pseudotsugae* and *Phaeocryptopus gaeumanni* [32, p. 410], were

the subject of the author's discourse in May, 1955, on the occasion of the 125th anniversary of the foundation of the Faculty of Forest Economy at the same place.

PURI (Y. N.). **Rusts and wood-rotting fungi on some of the important Indian conifers.**—*For. Bull. Dehra Dun* (N.S. Mycology), 179, 10 pp., 1955.

The rusts and wood-rotting fungi of seven major Indian conifers are listed under their hosts, with notes on their distribution. Included are the following:—*Peridermium thomsoni* on *Abies pindrow* and *Picea morinda*; *Chrysomyxa deformans*, *C. piceae*, and *C. himalensis* on *P. morinda*; *Cronartium ribicola* and *Coleosporium barclayense* [31, p. 411] on *Pinus excelsa* in Kulu (Punjab), Bashahahr (Himachal Pradesh), Chakrata (Uttar Pradesh) and Kashmir; *Melampsora oblonga* [loc. cit.] on the same host in Uttar Pradesh; and *C. campanulae* on *P. longifolia*.

ROGISTER (J.). **Het verblauwen van hout.** [The blueing of wood.]—*Meded. Rijkslandbhoogesch. Gent.* (*Lab. Houttechnol.*) 13, 78 pp., 51 graphs, 1955. [French, English, and German summaries.]

Following a survey of 110 contributions to the literature on the biology, physiology, pathogenicity, and economic effects of the fungi responsible for blue stain of timber, a comprehensive account is given of studies on the development of this defect in poplar wood inoculated with *Botryodiplodia theobromae* [cf. 34, p. 562] at the Laboratory for Wood Technology of the Agricultural College, Ghent, Belgium.

There was no apparent correlation between the intensity of the discoloration and the water content of freshly felled timber. The damage appeared to be most severe on wood felled in March and probably also during April and July; it was absent from that cut in December, May, and June. Blueing decreased as time went on in wood slowly ageing under the bark. In timber felled between August and December the stain deepened conspicuously during February and March.

Steaming of fresh and aged timber under atmospheric or more especially higher pressure resulted in a marked increase of blueing, declining with age except in the case of the February and March fellings, in which infection was consistently heavier than for the two or three preceding months. Discoloration by *B. theobromae* is exceptional in wood with a water content below fibre saturation point, but it developed at this level after steaming even in aged timber (nine months after felling). Steamed, severely stained timber was found to attain hygroscopic equilibrium much more rapidly after desiccation than steamed sound wood. Drying fresh wood at 60° to 80° C. or in the air enhanced the intensity of blue stain, which failed to develop, however, under the bark of blocks dried for one to two months to a moisture-level below fibre saturation point. Steaming prior to air-drying prolonged the period favourable to infection and discoloration. Desiccation followed by immersion in water (especially at 50°) caused a uniform increase in the severity of blueing in wood freshly felled or aged for one month. Boiling for a quarter- to half-an-hour exerted a similar effect to steaming.

WEISSE (G.). **Nachpflege von Schwellen.** [After-care of sleepers.]—*Int. Holzmarkt, 1955*, 14, pp. 51–52, 1955.

The unduly short service life of German State railway sleepers impregnated against [unspecified] fungi with coal-tar oil is attributed to failure of the preservative to reach the heartwood of pine, while in beech, because the sleepers do not come to the dipping tank dry, a good proportion of the cross section of wood remains unimpregnated, and, moreover, damage by frost and red heart [28, p. 551] prevents the infiltration of the oil. The method of 'after-care' now practised on the German, Austrian, and Swedish State railways and those of a number of private concerns

involves periodical supplementary treatments with a chromium-arsenic salt mixture at a dosage of 4 kg. per cu. m., applied half in 'cartridge' and half in paste form. The cost (inclusive of labour) has been calculated in Austria as equivalent to 10 per cent. of that of a sleeper laid on the track. At this rate the treatment may be considered profitable even if it results in only three to four years' extension of service life.

Göhre (K.). **Holzschutzmittelkurzprüfung mit Hilfe der statischen Biegefestigkeit.** [A short method of wood preservative assay with the aid of static bending strength.]—*Arch. Forstw.*, 4, 4, pp. 293–301, 3 figs., 6 graphs, 1955.

At the Institute for Physical Wood Technology, Eberswalde, Germany, a method of assay for wood preservatives has been devised in which static bending strength is used as a criterion of their efficiency [cf. 22, p. 46]. Since a diminution of flexibility by the action of wood-destroying fungi is effected more rapidly than loss of weight, the experimental period can be reduced by the use of the 'dynstat' technique to 45 days as compared with three to four months for the standard DIN 52176 [35, p. 857].

In the experiments here described the test material comprised pine sapwood blocks, 15 by 10 by 4 mm. (as against 50 by 25 by 15 mm. in the standard procedure), inoculated with pure cultures of *Coniophora cerebella* [*C. puteana*], *Poria vaporaria*, and *Lentinus lepideus* on ground spruce pulp with a 5 per cent. malt extract solution. The threshold values obtained for an oily preservative (medium and heavy oils with naphthalene, etc.) by the dynstat and standard methods agreed consistently in parallel tests.

Wallen (V. R.) & Bell (W.). **Treatment of vegetable seed for improved emergence —1955.**—*Plant Dis. Reptr*, 40, 2, pp. 129–132, 1956.

In further tests of vegetable seed treatments at the Botany and Plant Pathology Laboratory, Science Service, Ottawa [cf. 33, p. 330], 24 kinds of seed, mostly one year old and of fairly high germinative capacity, were treated with seven fungicides and the antibiotic filipin [35, p. 32], then stored in stoppered flasks at room temperature for two to three weeks before being sown. Captan 50W was the best general treatment, giving a significant increase in germination with more kinds of seed than any of the others tested. The highest emergence of peas was obtained with phygon and spergon. Agrox C appeared preferable for beet and Swiss chard. Applied at the maximum retaining capacity of the seed, filipin improved emergence of cucumber, vegetable marrow, and muskmelon, but it was phytotoxic to beet, possibly because of the high retaining capacity of the seed.

Roll-Hansen (J.). **Gjødsling av grønsaker på friland.** [Fertilizing of outdoor vegetables.]—Reprinted from *Minneliste for Hagedyrkere, 1956*, 4 pp., 3 figs., 1956.

Boron deficiency is stated to be generally prevalent in Norway, affecting beets, celery, and swedes. The element is supplied in a reliable and convenient form by a special brand of boron-containing calcium cyanamide, 30 kg. of which is equivalent to 1 kg. borax. The amount per 10 ares [1 are = 119·6 sq. yds.] of the latter normally required as a soil amendment is 1½ kg.

Molybdenum deficiency, especially of cauliflower, is also widespread. It may be remedied by treatment of the soil with 100 to 200 gm. ammonium molybdate per 10 ares, while liming also frequently effects a cure.

Natti (J. H.), Hervey (G. E. R.), & Sayre (C. B.). **Factors contributing to the increase of downy mildew of Broccoli in New York State and its control with fungicides and agrimycin.**—*Plant Dis. Reptr*, 40, 2, pp. 118–124, 1956.

An increase in downy mildew (*Peronospora parasitica*) of broccoli in New York

State is attributed to a combination of causes, including the extensive planting of the susceptible variety Watham 29 during successive years, the increased acreage of broccoli, and the application of emulsifiable insecticides, which remove the bloom from the leaves and possibly dissolve wax from the cuticle, creating conditions favourable for spore germination. A hitherto unreported systemic invasion by the fungus of the apical portion of the plant is described. Under field conditions late-maturing varieties such as Calabrese and Grand Central were less severely affected than the early ones. Differences in resistance independent of plant maturity were also observed, the early DeCicco ranking next to the above varieties.

In field trials in 1955 four applications of agrimycin 100 (1 lb. per acre, in 25 and 100 gals. spray) and spergon SL (3 lb. and the same two volumes) gave the most promising control, reducing the number of mildew lesions per leaf from 32 (untreated) to 14 and 15 and 15 and 17, respectively.

The results agreed with those of 1954, when the two materials were shown to be compatible with the insecticide (parathion plus TEPP) with which they were applied. Agrimycin caused slight leaf yellowing.

Sylvester (E. S.). **Aphid transmission of nonpersistent plant viruses with special reference to the Brassica nigra virus.**—*Hilgardia*, 23, 3, pp. 53–98, 1954.

This paper presents detailed results of the author's extensive studies on the transmission of the *Brassica nigra* virus [turnip mosaic virus: 33, p. 398] by *Myzus persicae* to *B. juncea* seedlings, with some comparisons of transmission by *Rhopalosiphum pseudobrassicae*. It includes tabulated results of a series of experiments concerning acquisition periods and fasting, the effects of temperature, and the virus charge of the insects. *M. persicae* was the better vector. Acquisition was increased if the feeding period terminated naturally and if five or more 15-second feedings were used. The amount of virus taken up decreased after 15 minutes' feeding, the optimum being at five minutes, and was nil after four hours. Infection was increased by preliminary fasting but decreased by subsequent fasting, both these effects being neutralized by low temperatures (down to 5° C.). Infective vectors lost virus more rapidly (in 30 minutes) when subsequently fed on healthy plants than when fasted (three hours).

The literature concerning all aspects of aphid transmission of viruses is reviewed and a bibliography of 114 titles appended. Various hypotheses concerning means of transmission are discussed. It is suggested that the transmission of non-persistent viruses by aphids is essentially mechanical, and that the efficiency and specificity of vectors arise from compatability factors which depend upon specific interactions between the viruses, the saliva of the aphids, and the host plant cells inoculated.

Afanasiev (M. M.). **Resistance of inbred varieties of Sugar Beets to Aphanomyces, Rhizoctonia, and Fusarium root rots.**—*J. Amer. Soc. Sug. Beet Tech.*, 9, 2, pp. 178–179, 1956.

In greenhouse tests at Montana Agricultural Experiment Station, Bozeman, on various inbred beets for resistance to root rots [35, p. 260], none showed outstanding resistance to *Aphanomyces cochlioides* but 19 varieties were highly resistant to *Rhizoctonia* [*Corticium*] *solani* and 22 to *Fusarium oxysporum* f. [*F. conglutinans* var.] *betae*. Four varieties combined resistance to both *C. solani* and *F. c.* var. *betae*.

Zimmer (K.) & Brandes (J.). **Elektronenmikroskopische Untersuchungen über das Rübenmosaik-Virus.** [Electron-microscopic studies on the Beet mosaic virus.]—*Phytopath. Z.*, 26, 4, pp. 439–442, 1 fig., 1 graph, 1956.

At the Institute for Agricultural Virus Research, Brunswick, Germany, an isolate of beet mosaic virus [35, p. 803] was inoculated mechanically into Klein-

wanzleben E sugar beet, *Chenopodium quinoa*, *C. album*, and *Amaranthus retroflexus*. The electron-microscopic examination of exudates of infected leaves obtained by Johnson's method [cf. 35, p. 138] revealed specific particles, more than 80 per cent. of which ranged from 695 to 770 mμ in length, giving a mean value of approximately 733 mμ.

Heiling (A.), Steudel (W.), & Thielemann (R.). **Zur Frage der gegenseitigen Beziehungen zweier epidemisch auftretender Krankheiten der Beta-Rübe. (Ein Infektionsversuch mit dem Virus der Vergilbungskrankheit (Beta-Virus 4) und mit Cercospora beticola Sacc.)** [On the question of the reciprocal relations of two *Beta* Beet diseases occurring in epidemic form. (An inoculation experiment with the virus of yellows disease (Beta virus 4) and with *Cercospora beticola* Sacc.)]—*Phytopath. Z.*, 26, 4, pp. 401–438, 1 fig., 5 graphs, 1956.

This is an exhaustive, fully tabulated report of an experimental study undertaken at the Elsdorf (Rhineland) branch of the German Biological Institute to determine the reason for the increased susceptibility to leaf spot (*Cercospora beticola*) of beets infected by the yellows virus [35, pp. 737–741, 805, and next abstracts]. The Kleinwanzleben E, Kleinwanzleben N, and Polybeta varieties were inoculated with a combination of beet yellows and mosaic viruses, using *Myzodes* [*Myzus*] *persicae* as the vector, and *C. beticola*. Two plots were inoculated with the viruses on 15th June and two on 14th July, the fungus being added on 23rd July to approximate to the customary late development of infection under local conditions.

The most virulent symptoms occurred on the plots inoculated with the viruses in July; the massive degree of infection, reaching a climax during the autumn, precluded any observations on varietal differences. Severe virus infection thus provides particularly favourable conditions for the growth of *C. beticola*. In the blades of jointly infected leaves the content of carbohydrates and of soluble and insoluble nitrogen was lower than in healthy ones; carbohydrates were also deficient in the petioles of diseased foliage but their nitrogen content was significantly higher than that of the sound ones [cf. 33, p. 573]. Combined infection, therefore, results in a cumulative reduction in the transport of carbohydrates from the lamina to other organs while increasing that of soluble nitrogen. This is in accordance with the fact that yellows- and leaf spot-diseased beets contain less dry matter and saccharose, and more reducing sugar, soluble, injurious [33, p. 194], and insoluble nitrogen than healthy ones. Reflecting the observations made during the growing period, the heaviest reductions in leaf yield and sugar content occurred in the late virus- plus *C. beticola*-infected plots.

On an agar medium with beet leaf extract as the sole source of nutriment, *C. beticola* throve in the presence of sap from yellows virus-diseased foliage, whereas the cultures supplied with healthy leaf extract produced considerably weaker mycelia, which after a time ceased to grow and ultimately degenerated extensively. These differences in growth could be largely minimized, but not altogether eliminated, by the addition of 1 per cent. glucose to the medium.

Koppelberg (B.) & Steudel (W.). **Die wirtschaftliche Bedeutung des Systox-Einsatzes zur Bekämpfung der Vergilbungsschäden an Zuckerrüben im Rheinland 1954.** [The economic importance of the application of systox for the control of yellows damage on Sugar Beets in the Rhineland 1954.]—*Zucker*, 9, 16, pp. 387–391, 1 map, 1956.

The economic aspects of the Rhenish co-operative campaign for beet yellows virus control by spraying with systox in 1954 [35, p. 739 and next abstract] are discussed on the basis of a detailed analysis of the yields and costs. It is concluded that the profitability of aphicidal treatments cannot be predicted with the same

degree of reliability in areas of mild infection, e.g., Euskirchen and Bonn, as in those where heavy outbreaks are the rule, such as München-Gladbach-Neuss. Under the former conditions yield reductions may well be avoided by rational methods of cultivation which would be inadequate for prevention under the latter. The decision whether to spray or not must therefore be left to the discretion of individual producers in the less severely threatened zones, but in those where epiphytotics are habitual or frequent the use of systox is definitely to be recommended [cf. 34, p. 829; 35, p. 569].

HANF (E.). **Die Vergilbungskrankheit der Zuckerrübe im süddeutschen Raum unter besonderer Berücksichtigung der Verhältnisse in Rheinhessen-Pfalz.** [The Sugar Beet yellows disease in the south German region, with special reference to the conditions in the Rhenish Hesse-Palatinate.]—*Höfchen-Briefe*, 8, 5, pp. 226–231, 1955. [Abs. in *Z. PflKrankh.*, 63, 9, p. 554, 1956.]

On the basis of observations to date, the Worms-Frankenthal-Gross Gerau district is the only part of south Germany to be classed as heavily infected by beet yellows virus [see preceding abstract]. The moderately severe to mild outbreaks experienced elsewhere may be combated by well-known preventive methods. The results of spraying with systox at a dosage of 400 ml. per ha. in a co-operative campaign organized by the Mainz Plant Protection Station and conducted in the Upper Rhenish plain in 1953 and 1954 are reported to have been completely satisfactory [35, p. 569 *et passim*]. Metasystox, tested for the first time in 1954, was comparable to systox in efficiency when applied at 800 ml. per ha.

GRANCINI (P.). **Il 'giallume' delle Barbabietola in Italia.** [Beet yellows in Italy.]—*Pubbl. Staz. sper. Bieticolt., Rovigo*, N.S., 35, 15 pp., 2 col. pl., 1955.

After briefly summarizing Schlösser's views on the origin and transmission of beet yellows virus [32, p. 528], noting the effect of the disease on yield and sugar content, as described by Hull [cf. 33, p. 586], and referring to its wide geographical distribution, the author points to evidence that the disease may have been present in Italy [35, p. 803] since 1947, but has not become widespread, even where it is of some years' standing, and gives no cause for alarm. Spread is limited by the rarity of aphids, especially *Myzus persicae*, in the affected areas. The symptoms of the disease, as observed at Milan, are described, and the paper concludes with notes on control by the usual methods.

WATSON (MARION A.). **The effect of sucrose spraying on symptoms caused by Beet yellows virus in Sugar Beet.**—*Ann. appl. Biol.*, 43, 4, pp. 672–685, 2 graphs, 1955.

In experiments carried out in a glasshouse at Rothamsted Experimental Station, when leaves of potted Kleinwanzleben E sugar-beet plants experimentally infected with beet yellows virus [31, p. 217; 35, p. 869] by means of *Myzus persicae* were sprayed daily with 10 per cent. sucrose solution, the yellowing symptoms were intensified. When the light intensity was reduced to one-half to one-third the symptoms were suppressed more on the unsprayed than on the sprayed plants.

Spraying increased the total carbohydrate content of the leaf lamina in all experiments, and the effects on symptom intensity and carbohydrate content were closely correlated. The regression coefficients of symptom score (each leaf scored weekly on a scale of 0 to 3 for extent and intensity of yellowing and etch independently, and the scores of all leaves added to give total score for each plant) on total sugar content were almost identical for shaded and unshaded plants; an increase in total sugar of 1 per cent. of residual dry matter increased the symptom score for both sets by 0·4, but at any given sugar content the symptom score for shaded plants was about 2·6 more than that for the unshaded. This difference was probably

due to the longer survival of the older leaves with yellowing symptoms on shaded than on unshaded plants. As the severity of the symptoms was increased by supplying carbohydrate without changing the conditions of lighting, it is concluded that light intensity affects symptom expression through its effect on photosynthesis. Spraying increased the root yield in both healthy and infected plants, and most of the increase was sucrose, showing that the sprayed sugar was translocated to the roots. Translocation was not arrested by infection.

Infected leaves were shorter than normal; sprayed leaves were longer, and some showed indications of an increase in growth hormones. The effects of infection and of sugar spraying on leaf growth appeared to be antagonistic, though on carbohydrate accumulation and symptom production they were complementary.

Bobrov (Ruth A.). **Cork formation in table Beet leaves (Beta vulgaris) in response to smog.**—*Proc. third nat. Air Pollution Symp.* (*1955*), pp. 199–206, 6 figs., 1955.

Beet leaves become cicatrized on the lower surface in response to smog in the Los Angeles county, California. Some of the cells around the substomatal chambers become dehydrated [cf. 32, p. 478], anthocyanin increases in the area, the lower epidermal cells may collapse, and the intercellular spaces become heavily suberized. The cells of the lower mesophyll then divide tangentially, become suberized, and by compression against one another form a cork layer. The smog apparently induces some chemical change within the leaf which initiates cork formation [cf. 36, p. 48].

Sánchez P. (A.). **Efectividad de varios fungicidas usados solos y en combinación para el control del damping-off y la pudrición de semillas en Arvejas y Frijoles.** [Effectiveness of various fungicides used alone or in combination in the control of damping-off and seed decay in Peas and Beans.]—*Acta agron. Palmira*, 6, 1, pp. 1–35, 5 figs., 1956. [English summary.]

The author describes experiments made at Michigan State College in 1953–4, on seed treatment of Alderman peas and Round Pod Kidney Wax beans [*Phaseolus vulgaris*: cf. 32, p. 602]. Of the various fungicides tested, captan proved the best for control of pre-emergence damping-off, while spergon was relatively ineffective. No advantage was obtained by combining fungicides which were individually effective, and these were equally effective under high (20 to 24° C.) and low (18 to 20°) temperature conditions, *Pythium* spp. predominating under the latter conditions, and *Fusarium* spp., followed by *Rhizoctonia* spp., under the former.

Down (E. E.) & Andersen (A. L.). **Agronomic use of an X-ray-induced mutant.**—*Science*, 124, 3214, pp. 223–224, 1956.

A new bush bean (*Phaseolus vulgaris*), Sanilac, has been developed co-operatively by the Michigan Agricultural Experiment Station and the United States Department of Agriculture from crosses between a bush-type, X-ray-induced mutant of the vine variety Michelite and strains resistant to anthracnose (*Colletotrichum lindemuthianum*). It is similar to Michelite in seed type, canning quality, and resistance to bean mosaic virus [35, p. 60] and in addition possesses resistance to the alpha strain of *C. lindemuthianum* [35, p. 572] and is less affected by *Sclerotinia sclerotiorum* [29, p. 599].

Sanilac will be grown by foundation growers in 1956 for certification in 1957.

Napier (Eunice J.), Turner (Dorothy I.), Rhodes (A.), & Toothill (J. P. R.). **The systemic action against Pseudomonas medicaginis var. phaseolicola of a streptomycin spray applied to dwarf Beans.**—*Ann. appl. Biol.*, 44, 1, pp. 145–151, 1956.

In experiments conducted at the Glaxo Laboratories, Stoke Poges, Bucks, Sutton's selected Canadian Wonder dwarf bean plants (*Phaseolus vulgaris*) were

sprayed when the primary leaves were almost fully expanded and the first trifoliates had begun to appear with approximately 0·75 ml. of streptomycin solution with 0·05 per cent. (v/v) agral LN wetter, applied to the dorsal surface of the pair of primary leaves only. A standardized inoculum of *Pseudomonas medicaginis* var. [f. sp.] *phaseolicola* [cf. 33, p. 574] was later applied to the ventral surface of one-half of the lamina of each leaflet of the trifoliate leaves when these were at the most susceptible stage of development.

The results showed that the streptomycin exerted a marked, consistent, systemic, antibacterial, prophylactic action even at sites as remote from the point of application as the fourth trifoliate leaf. This systemic protection against *P.m.* f. sp. *phaseolicola* persisted for periods ranging up to 11 days. Mannosidostreptomycin was greatly inferior in its systemic effect against halo blight, and the proportion of it in any crude form of streptomycin used in the field should be checked. It is suggested that the discrepancy between the systemic prophylactic effect of the streptomycin found in these experiments and its apparent absence from those of Mitchell *et al.* [loc. cit.] may be ascribable to the use here of greater quantities, applied under somewhat different conditions, and using different methods to estimate the amount of protection given.

The systemic effects produced by the streptomycin spray in the present work suggest that this antibiotic may confer useful practical benefits. In most of the trials of streptomycin as an agricultural bactericide under field conditions already reported [36, p. 30 *et passim*] the antibiotic appears to have been applied in the conventional manner, by spraying to 'run-off'. It may be that, by virtue of its systemic property, it could provide effective cover from a low-volume spray that avoided 'run-off'; it may also, perhaps, afford protection to new foliage developed some time after completion of the spraying.

Hogg (W. H.). **Weather and the incidence of chocolate spot on Beans.**—*N.A.A.S. quart. Rev.*, *1956*, 32, pp. 87–92, 1 graph, 1956.

Co-operative studies by the Meteorological Office and National Agricultural Advisory Service, South-Western Province, England, from 1942 to 1953 inclusive, suggested that the incidence of chocolate spot (*Botrytis fabae*) of [broad] beans [35, p. 112] is related to the frequency of near-saturation hours and that, like potato blight [*Phytophthora infestans*: 32, p. 585], its onset is predisposed by the occurrence of a certain period when the relative humidity is continuously above a given limit. The function of relative humidity may also be connected with other factors, such as temperature, as in the case of potato blight.

Thompson (A. E.) & Hepler (P. R.). **A summary of resistance and susceptibility to Puccinia asparagi DC. within the genus Asparagus.**—*Plant Dis. Reptr*, 40, 2, pp. 133–137, 1956.

In inoculation experiments at the University of Illinois the following monoecious species of asparagus, previously reported as resistant to or immune from rust (*Puccinia asparagi*) [33, p. 333], were found to be susceptible: *Asparagus plumosus* vars. *nanus*, *pyramidalis*, and *robustus*, *A. sprengeri* var. *robustus*, *A. virgatus*, and a dwarf Chinese species (PI 23016). *A. rivalis* and *A. laricinus* remained consistently free from the disease. The dioecious *A. filicinus* was as highly susceptible as the cultivated *A. officinalis*.

Gualaccini (F.). **Trasmissibilita del virus producente il mosaico del Peperone, mediante la Cuscuta, e prove di identificazione di esso.** [Transmissibility of the virus causing Chilli mosaic by means of *Cuscuta*, and tests of its identification.] —*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 79–101, 13 figs., 1956. [English summary.]

Continuing his investigations [cf. 35, p. 492], the author conducted experiments

on the transmission of the virus causing chilli mosaic by means of dodder (*Cuscuta pentagona*) from infected chilli plants to healthy White Burley, Perustitza, Xanty Yakà, and Herzegovina tobacco plants, *Nicotiana glutinosa*, tomato, and beet. Positive results were obtained with Perustitza tobacco plants only, on which mosaic symptoms developed two months after connexion to the infected chilli plant, the same result also being obtained by mechanical inoculation. These and other inoculation experiments indicated that the chilli plants with symptoms of mosaic contained a strain of tobacco mosaic virus.

Van Hoof (H. A.). **Het vuur bij Andijvie (Marssonina panattoniana).** ['Fire' in the Endive (*Marssonina panattoniana*).]—*Meded. Dir. Tuinb.*, 19, pp. 431–436, 2 figs., 1956. [English summary.]

In this expanded account of investigations in Holland on anthracnose of endive [35, p. 573], *Cichorium pumilum* is mentioned as one of the hosts giving positive results in inoculation experiments. The geographical distribution of the fungus is also given [map 82].

Marini (E[nrica]). **Una virosi trasmessa per seme : il mosaico della Latuga.** [A seed-transmitted virosis: Lettuce mosaic.]—*Riv. Ortoflorofruttic. ital.*, 39, 9–10, pp. 449–454, 3 figs., 1955.

After stating that lettuce mosaic virus [cf. 35, p. 505 *et passim*] is so severe in Lombardy that crops are sometimes rendered entirely unsaleable, the author gives a brief account of the disease and its control, based largely on the relevant literature. A bibliography of 16 titles is appended, most of which have been noticed in this *Review*.

Johnson (H. W.), Chamberlain (D. W.), & Lehman (S. G.). **Soybean diseases.**—*Fmrs' Bull. U.S. Dep. Agric.* 2077, 16 pp., 10 figs., 1955.

This bulletin describes the more important bacterial, fungus, and virus diseases of soy-beans in the United States [cf. 24, p. 264; 27, p. 6; 28, pp. 154–157; 35, p. 66 *et passim*] and their control. A table is appended of disease resistant varieties, listing the regions to which they are suited.

Chevaugeon (J.). **Les maladies cryptogamiques du Manioc en Afrique Occidentale.** [The cryptogamic diseases of Cassava in West Africa.]—*Encycl. mycol.*, 28, vi+205 pp., 26 pl., 4 figs., 19 graphs, 5 maps, Paris, Paul Lechevalier, 1956. Fr. 4,500.

This comprehensive monograph on the cryptogamic diseases of cassava is based on field and laboratory studies carried out since 1948 in different parts of French West Africa.

The first chapter deals with the botany, history and present status of the host itself in the region concerned, and the fungi recorded on it from all parts of the world are listed in chronological order with a summary of the pathogenicity of those parasitic in different countries.

The second chapter refers to climatic factors and laboratory technique, and chapter three gives full descriptions of all the fungi known on cassava in West Africa (73 species, including 17 newly described). The writer then describes the relationships between these organisms and concludes that the fungi chiefly concerned with disease in cassava are *Glomerella cingulata* f. sp. *manihotis* f. nov., affecting leaves, stems, and shoots, and *Cercospora henningsii* and *C. caribaea* on the leaves.

The remaining chapters are concerned with the author's studies on the biology of these last-named fungi, the effect of environmental and other factors on sus-

ceptibility to them, and their behaviour in culture. The final chapter summarizes the whole work, and a bibliography of 143 titles is appended.

Matsumoto (T.). **Studies on the storage diseases of Water-Chestnuts and post-harvest treatments, particularly curing as an effective means of disease control.** —*Spec. Publ. phytopath. Lab. Coll. Agric. Taiwan Univ.* 1, 55 pp., 3 pl., 1 fig., 1955. [Chinese summary.]

The chief storage diseases of the water-chestnut (*Eleocharis plantaginea* var. *tuberosa*) [*E. tuberosa*] in Formosa are black rot (*Ceratostomella* [*Ceratocystis*] *paradoxa* [12, p. 335]), causing a soft rot of the flesh of the corm; false black rot due to *C. adiposum* [11, p. 544], in which the flesh becomes spongy, but less soft than in black rot; *Trichoderma* rot, affecting the surface and subsequently the flesh of the corm, and due to *T. viride*; *Trichoderma* rot A, probably caused by another form or race of the same species, resulting in a drier rot and formation of a central cavity; and *Pythium* rot (*P. spinosum*), appearing as a white mycelial growth in wounds on the surface of the corm.

Infection by *C. paradoxa* progresses most rapidly at 28° C. and liquefies the flesh of the corm within three to four days after inoculation. Disease development is slower at 22°, and greatly retarded at 16° and 34°. *T. viride* behaved similarly, though with less reduction in its activity at 22°.

These diseases, mostly due to wound parasites, may be controlled by curing the corms immediately after harvest. If held at 30° to 32° in a saturated atmosphere for three days the wounded tissues become thickened and filled with tannin-like substances, and eventually lignified. Spores of *C. paradoxa* and *T. viride* failed to germinate apparently because of the lack of some necessary substance rather than the toxicity of the tissue exudates. Care should be taken to avoid corm wounds as far as possible.

Kosswig (W.). **Probleme der Gurkenwelke.** [Problems of the Cucumber wilt.]— *Höfchen-Briefe, 1955*, 3, pp. 152–169, 9 figs., 1955. [Received August, 1956.]

The difficulties presented by the control of the cucumber wilt caused by *Fusarium oxysporum* f. *melonis* in Germany [35, p. 265] are discussed in the light of 16 contributions to the literature on the subject. The results of experiments at the Phytopathological Institute of the University of Bonn confirmed those of Groenewegen in Holland [33, p. 335] in respect of the efficacy of grafting on the immune *Cucurbitaria ficifolia* as a remedial measure.

Andeweg (J. M.). **The breeding of scab-resistant frame Cucumbers in the Netherlands.**—*Euphytica*, 5, 2, pp. 185–195, 7 figs., 1956. [Dutch summary.]

In selection work carried out in the Netherlands for the development of frame cucumber varieties resistant to scab (*Cladosporium cucumerinum*) [35, pp. 649, 659] the resistant slicing variety Esvier was produced in 1956 by the Institute of Horticultural Plant Breeding, Wageningen.

The plants are tested for resistance by Walker's method [30, p. 357]. As soon as the first normal leaf has developed and the second has become visible potted plants are transferred to high humidity. An aqueous suspension of *C. cucumerinum* spores (a mixture of cultures of different origin being used) is then applied with a mist sprayer, air humidity being kept at 100 per cent. for at least six hours. The temperature range is 15° to 20° C., the difference between resistant and susceptible plants being most conspicuous at 17°. After about five days the stem tops and petioles of susceptible plants have rotted completely, while resistant plants are scarcely affected. Resistance in fully grown plants can be assessed five to six days after inoculation if healthy, actively growing stem tops 15 to 20 cm. long are placed in water and kept at high humidity.

Coe (D. M.). **Streptomycin as a control for downy mildew of cucurbits.**—*Plant Dis. Reptr*, 39, 10, pp. 729–730, 1955.

At the Florida Everglades Experiment Station, Fort Pierce, agrimycin (200 p.p.m.), tribasic copper sulphate (4 parts per 100), and combinations of the two at various levels, applied weekly during May, gave significant control of downy mildew (*Pseudoperonospora cubensis*) [35, p. 72] on Marketer cucumbers, the disease control indexes (scored on a 1 to 10 basis) being 4·75, 6, and 5·13 to 6·88, respectively, as against 2·25 for the untreated. No significant differences appeared at harvest, but the yields strongly tended to parallel the disease control index ratings.

Da Matta (E. A. F.). **Ferrugem da Maxixe (Puccinia cucumeris P. Henn.).** [Rust of the 'Maxixe' (*Puccinia cucumeris* P. Henn.).]—Reprinted from *Bol. Inst. biol. Bahia*, 1, 1, 4 pp., 2 figs., 1955. [Received August, 1956.]

Cucumis africanus, stated to be largely used for food in Bahia [though a species of this name is known in South Africa as a poisonous plant], is susceptible to infection by *Puccinia cucumeris*, which was stated by Viégas to have been first recorded for the Americas in his Uredinales of Brazil [25, p. 141]. It produces on the leaf blades (mostly the under sides) and petioles orange-yellow, isolated or aggregated uredosori, 300 to 400 μ in diameter, which at first are covered by the epidermis but later rupture it and liberate a pulverulent mass of smooth, globular uredospores, 20 to 30 by 18 to 24 μ, of the same colour. The black teleutosori, irregularly scattered over both leaf surfaces, contain reddish-brown, ellipsoid, uniseptate spores, 32 to 44 by 24 to 32 μ. The growth of rusted plants is retarded and fruit production reduced, while the leaves gradually turn yellow and shrivel completely.

Emiliani (G.). **Prove di sperimentazione antiperonosporica : anno 1955.** [Experimental tests against downy mildew: year 1955.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 13 (*1955*), pp. 171–191, 1 diag., 1956. [English summary.]

In further spraying tests against downy mildew [*Plasmopara viticola*: 35, p. 811] carried out near Rome in 1955, three-year-old Italia vines were sprayed 13 times between 7th May and 3rd October with two micro-copper and one non-copper compound, which were tested against 1 per cent. Bordeaux mixture. The organic compounds were 'cupreous dithex' (60 per cent. zineb, 6·5 per cent. basic copper carbonate), 'ortho' or 'fungicide CF 11' (50 per cent. captan, with traces of copper); and 'aspor' (87 per cent. zineb). These products were used at dosages of 0·25, 0·4, and 0·25 per cent., respectively. For the first application orthocide at 0·25 per cent. had to be substituted for ortho, and for the first two applications the Bordeaux mixture was used at 0·7 per cent. to avoid burning the foliage.

At the end of July, the vines treated with ortho, Bordeaux mixture, aspor, and cupreous dithex had, respectively, 1·92, 3·91, 4·45, and 7·22 per cent. leaves infected. At a second count, made on 10th August, the ratings were 22·11, 12·04, 7·85, and 12·38. Though ortho and Bordeaux mixture were significantly superior at the first count, on the basis of the second the differences between the various treatments cannot be considered significant.

Baldacci (E.). **I nuovi prodotti acuprici nella lotta antiparassitaria.** [The new non-copper products in anti-parasitic control.]—Reprinted from *Boll. Agric., Milano*, 14, 11 pp., 1955.

In spraying tests against vine downy mildew [*Plasmopara viticola*: see preceding abstract] carried out in the Po valley in 1952, in which non-copper products (thiocarbamates) were tested against Bordeaux mixture, eight applications of each spray being made, infection of the fruit clusters on Croattina vines on 31st July

was 3·5 to 16·8 per cent. for vines treated with Bordeaux mixture, 0·6 to 1·4 per cent. for those treated with thiocarbamates (other than captan, the results with which are to be presented later), and 35 to 44 per cent. for the untreated. On 22nd September, the corresponding figures were 6·5 to 20·3, 3·9 to 4·5, and 57·6 to 75·2 per cent.

In 1953, 11 treatments were made. On 1st July, the corresponding figures for leaf infection were 17·6, 15·7 to 21, and 39·6 per cent., while those for infection of the fruit clusters were 9·2, 6·1 to 6·7, and 24·8 per cent. On 6th August, the figures for infection of the fruit clusters were 21·6, 13·6 to 15·8, and 77·7 per cent.

In 1954, experiments were conducted to determine the optimum and minimum dosages for the thiocarbamates. Ten applications were made of each material. On 23rd July, Barbera vines treated with Bordeaux mixture 0·3, 0·6, and 1 per cent. had, respectively, 44·6, 25, and 14·9 per cent. leaf infection; those treated with thiocarbamates used at 0·1, 0·2, and 0·3 per cent. had, respectively, 12·7 to 16·6, 5·5 to 8·1, and 3·1 to 7 per cent. infection; and the figure for the untreated was 52·7 to 89·3 per cent. The corresponding figures for Croattina vines were 21·9, 15·2, 12·2; 5·1 to 7·1, 1·5 to 5·4, 1·3 to 1·8, and 74 to 92·1 per cent.

On 27th July, the corresponding figures for infection of the fruit clusters on Barbera vines were 49·1, 6, 2·9; 4·9 to 9·2, 0·8 to 3·7, 0·6 to 5·4, and 98·8 to 100 per cent. The corresponding figures for Croattina vines were 25·8, 31·7, 6·8; 5·3 to 7·4, 0 to 4·7, 6 to 16·6, and 100 per cent. The thiocarbamates were thus most effective at 0·2 per cent.

It is apparent that the thiocarbamates gave better control than Bordeaux mixture and large-scale tests should now be undertaken to determine under what precise conditions these new materials are likely to give the best control.

Baldacci (E.), Fogliani (G.), & Borsa (P.). **Le malattie della Vite secondo i dati di una nostra inchiesta.** [The diseases of the Vine according to the data obtained in an inquiry by us.]—Reprinted from *Atti Accad. Vite*, 6 (*1954*), 47 pp., 6 graphs, 4 maps, 1954. [Received 1956.]

In November, 1952, a detailed questionnaire was sent to vine-growers in all parts of Italy with the purpose of gaining information as to factors affecting the incidence and development of downy mildew [*Plasmopara viticola*], *Oidium* [*Uncinula necator*], and court-noué. This questionnaire is reproduced in the present paper, and the answers received are tabulated and fully discussed.

Topalović (G.). **Neka iskustva u predviđanju pojave plamenjače Vinove Loze.** [Certain experiences in forecasting downy mildew appearance in Grape Vine.] —*Zasht. Bilja* (*Plant Prot., Beograd*), *1956*, 34, pp. 1–19, 5 graphs, 1956. [French summary.]

The biological development of vine downy mildew (*Plasmopara viticola*) [35, p. 75] under the climatic conditions of Vojvodina, Serbia, Yugoslavia, and its control from 1950 to 1954 are discussed. Taking into consideration the number of spores and the date of their maturity and germination, the state of growth of the vines, and the local climatic conditions, it is possible to forecast the period of disease appearance and its intensity, and thus to determine the date of the first spray application, usually after the manifestation of primary infection. The subsequent sprays are determined by the incubation period (from infection to the production of conidia) and in accordance with the rainy period. Practical control of the disease was obtained in 1951 with one and in 1952 with three sprays of 1 to 1·5 per cent. Bordeaux mixture, in 1953 with three sprays of a 2 per cent. concentration and three dustings of the fruit with a powder preparation based on copper, and in 1954 with four or five sprays of 2 to 3 per cent. Bordeaux mixture plus one dusting.

DE MARNEFFE (R.) & DELHAYE (R.). **Rapport No. 8. Résumé des essais pratiqués.** [Report No. 8. Summary of experiments conducted.]—17 pp., 5 pl., Station Provinciale de Recherches Scientifiques de Viticulture, Belgique, 1955.

In the section of this report (pp. 10–12) dealing with research on vine root rot (*Armillariella* [*Armillaria*] *mellea*) [cf. 30, p. 402 *et passim*] at the Provincial Station of Scientific Research in Viticulture, La Hulpe, Belgium, it is stated that when the fungus was grown in the presence of *Trichoderma viride* [cf. 34, p. 583] its growth rapidly became arrested. Attempts are in progress to use *T. viride* as a means of controlling *A. mellea* on roots of vines growing in greenhouses.

As a result of experiments it is recommended that vine roots infected by *A. mellea* should be treated, after removal of the superficial soil, with a 1 per cent. solution of an organo-mercury salt and then covered again with virgin soil, the surface of which should be treated with the same solution at half-strength, at the rate of 20 l. per sq. m. During the year, two applications of neutral orthoxyquinoline sulphate (1 in 10,000) should be made.

RAMAKRISHNAN (T. S.) & SUNDARAM (N. V.). **Grapevine diseases and their control.** —*Madras agric. J.*, 42, 3, pp. 108–115, 2 pl., 1955.

Diseases of grape vines in Madras State [cf. 35, pp. 329–330], where the crop occupies some 500 acres, include downy mildew (*Plasmopara viticola*), powdery mildew (*Uncinula necator*), anthracnose (*Elsinoe ampelina*), and brown leaf spot (*Cercospora viticola*) [*C. vitis*]. Control operations against combined infection by anthracnose and the mildews include treatment of pruning cuts with Bordeaux paste, spraying with 3–3–50 Bordeaux mixture or cupravit ob 21 two to three weeks later, and with 5–5–50 Bordeaux or cupravit ob 21 before flowering and again after fruit set and on the young bunches. In dry weather, sulphur dust may be applied before flowering and on young fruit.

HARVEY (H. L.). **Plant diseases. Bean, subterranean Clover, and Lupin diseases caused by the Bean yellow mosaic virus in Western Australia. Dahlia virus diseases.**—*J. Dep. Agric. W. Aust.*, Ser. 3, 5, 3, pp. 329–336; 336–338, 12 figs., 1956.

In the first paper the author gives an account in popular terms of the symptoms, transmission and seasonal carry-over, and incidence in Western Australia of bean yellow mosaic virus [cf. 34, p. 725] in French beans [*Phaseolus vulgaris*], subterranean clover [*Trifolium subterraneum*], West Australian blue lupin (*Lupinus varius*), New Zealand blue lupin (*L. angustifolius*), yellow lupin (*L. luteus*), and burr medic (*Medicago denticulata*). In most years bean yellow mosaic virus is as important on beans as any other disease affecting this crop; it appears to be more severe in early-spring sown French beans than in main summer crops of runner beans [*P. coccineus*]. The annual incidence of the disease depends on the degree of aphid activity; persistence in summer in some areas, in the absence of its known hosts, is probably due to a wild host, as yet unknown.

In the second paper a brief note is given on the symptoms and control of the dahlia diseases caused by dahlia mosaic virus [cf. 31, p. 104] and tomato spotted wilt virus [cf. 28, p. 512], both important locally.

GRANCINI (P.). **Osservazioni su alcune malattie da virus delle piante.** [Observations on some virus diseases of plants.]—Reprinted from *Boll. Agric., Milano*, 89, 34, 32 pp., 9 pl, 1955.

In this paper, read before the Agricultural Society of Lombardy on 8th May, 1954, an introductory discussion of the problem of plant virus diseases in general

refers to the difficulty of their recognition by growers, their control by the use of resistant varieties, their confused nomenclature, and the reasons for their prevalence in Italy. Thereafter, a succinct account is given of the symptoms, geographical distribution, and control of the following virus diseases: beet mosaic, beet yellows [33, p. 331], cucumber mosaic, lucerne mosaic, the viruses of the tobacco mosaic group, onion mosaic [cf. 24, p. 397; 34, p. 133], and bean mosaic [35, p. 147]. The paper terminates with brief notes on a number of plant virus diseases of lesser importance. A bibliography of 12 Italian titles is appended.

Silberschmidt (K.) & Tommasi (L. R.). **A solanaceous host of the virus of 'infectious chlorosis' of Malvaceae.**—*Ann. appl. Biol.*, 44, 1, pp. 161–165, 1 pl., 1956.

At the Instituto Biológico, São Paulo, Brazil, the authors transmitted the infectious chlorosis virus of Malvaceae [35, p. 678] by means of the white fly *Bemisia tabaci* from *Sida rhombifolia* to *Nicandra physaloides*. The insect also transmitted the virus from infected *N. physaloides* plants to healthy seedlings of *N. physaloides* and *S. rhombifolia*. This work affords experimental evidence that a white fly-transmitted virus occurring in the Malvaceae is able to infect a solanaceous plant, but attempts to infect tobacco failed.

Blattný (C.), Brčák (J.), Pozděna (J.), Dlabola (J.), Limberk (J.), & Bojňanský (V.). **Die Übertragung des Stolburvirus bei Tabak und Tomaten und seine virogeographischen Beziehungen.** [The transmission of stolbur virus in Tobacco and Tomato and its virogeographical relationships.]—*Phytopath. Z.*, 22, 4, pp. 381–416, 21 figs., 1 map, 1954.

The authors refer to work in the U.S.S.R. on stolbur disease [tomato big bud virus complex: 32, p. 403; 34, pp. 171, 278], pointing out that Suchov and Vovk *Dokl. Akad. Nauk S.S.S.R.* [*C.R. Acad. Sci. U.R.S.S.*], 53, 2, pp. 153–156, 1946; *Izd. Akad. Nauk S.S.S.R.* [*Publ. U.S.S.R. Acad. Sci.*], 103 pp., 1949; *Proc. Inst. Genet., Leningr.*, 17, pp. 236–238, 1950) [cf. 27, p. 48] distinguished between southern stolbur, transmitted by *Hyalesthes obsoletus*, and northern stolbur, which is found farther north where this vector does not occur, and is probably transmitted by a species of *Macrosteles*. They considered these diseases to be related to, but not identical with, tomato big bud virus [13, p. 62].

The authors report their own preliminary studies on the viruses in Czechoslovakia, giving brief descriptions of the symptoms of southern stolbur on tomato, tobacco, *Nicotiana sylvestris*, chilli, potato [35, p. 541], *Datura stramonium*, *Convolvulus arvensis*, *Lepidium draba*, chicory, sunflower, *Scabiosa purpurea*, and *Cirsium arvense*, and of (?) northern stolbur on tomato, *C. arvense*, and chicory. The diagnosis of the southern stolbur but not the northern was confirmed by Suchov.

In greenhouse grafting experiments infection was transmitted from tomato stocks infected with southern stolbur to scions of tomato, Samsun tobacco, *N. sylvestris* (only mild symptoms), and potato, which developed typical wilting after 60 days, followed by die-back. Grafting on to infected tomato stocks [cf. 35, p. 726] is considered to be a most reliable method of testing the resistance of new tobacco varieties to the virus. Attempts to transmit by mechanical means, using carborundum, were for the most part unsuccessful, though tobacco was infected with undiluted sap from *S. purpurea*.

Information is presented on the identification, distribution, and ecology of *H. obsoletus*. In experiments on the transmission of stolbur virus from tomato to tobacco and tomato with this vector success was achieved only once, with the second combination. When healthy and infected tobacco plants were planted out together in Prague infection spread to some of the healthy plants, though

H. obsoletus was not present. In later experiments the virus was transmitted from tomato to tomato and tobacco by *Aphrodes bicinctus*.

Convolvulus arvensis is of great importance as a host of the virus in the field and is a useful indicator of infection. Its presence or absence may prove to be the critical factor in deciding whether the disease will spread in apparently suitable but as yet unaffected regions. The authors have studied other viruses present in *C. arvensis* and are investigating possible vectors in relation to the virus in question.

They also report the symptoms of European yellows virus [23, p. 356] in *Taraxacum kok-saghyz*, *T. officinale*, *Cirsium officinale*, *Matricaria maritima*, and *Chrysanthemum indicum*. This shares with both types of stolbur virus the capacity to inhibit seed development in affected plants, and has*M acrosteles quadripunctulatus* as its vector. Yellows was transmissible in undiluted sap from *C. indicum* to *N. sylvestris*.

Rochow (W. F.) & Ross (A. F.). **Virus multiplication in plants doubly infected by Potato viruses X and Y.**—*Virology*, 1, 1, pp. 10–27, 2 graphs, 1955.

This is an expanded account of work carried out at Cornell University, Ithaca, New York, on simultaneous infections of tobacco with potato virus X and potato virus Y, which has already been noticed from another source [34, p. 431].

Rochow (W. F.), Ross (A. F.), & Siegel (B. M.). **Comparison of local-lesion and electron-microscope particle-count methods for assay of Potato virus X from plants doubly infected by Potato viruses X and Y.**—*Virology*, 1, 1, pp. 28–39, 1 graph, 1955.

In the course of studies on large increases in potato virus X in double infections with potato virus Y on tobacco [see preceding abstract] at Cornell University, Ithaca, New York, parallel assays by local lesion counts on *Gomphrena globosa*, electron microscope particle counts, and by a serological method were in agreement.

Thaler (Irmtraud). **Eiweißkristalle in der Epidermis von Scindapsus aureus.** [Protein crystals in the epidermis of *Scindapsus aureus*.]—*Phyton*, 6, 3–4, pp. 89–91, 2 figs., 1956.

Further studies in the current series [35, p. 747] revealed the presence of minute, double-refractive protein crystals in the epidermal cells of an aroid, *Scindapsus aureus*, at the Institute for Plant Physiology, University of Graz, Austria. The fact that the affected leaves display a yellow variegation is suggestive of virus infection.

Bartels (W.). **Akute Fragen der pflanzlichen Virologie.** [Acute problems of plant virology.]—*Wiss. Z. Univ. Rostock*, 4 (*1954–1955*), 4, pp. 455–471, 24 figs., [undated, received 1956].

Some of the crucial problems of present-day plant virus research are discussed, with concrete examples, in the light of 42 contributions to the literature on the subject, nearly all of which have been noticed from time to time in this *Review*.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 3, 11, pp. 173–175, 1955.

Details are given of the Yugoslav Regulations of 30th April, 1955 (which came into force on 10th June, 1955), relating to the health control of plants for importation, transit, and exportation, published in the Službeni List No. 22, 25th May, 1955. Phytosanitary certificates are required for plant imports with special provisos for potatoes and also for planting materials and seeds. The general importation of plants of Ulmaceae, *Castanea*, *Populus*, and certain conifers is prohibited.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 3, 7, pp. 110–111, 1955.

The Destructive Insect and Pest Regulations (Canada) are amended and consolidated by Order in Council P.C. 1954–2021 of 22nd December, 1954, published in *Can. Gaz.* (Part II), 89, 1, 1955, which revokes the Regulations of 1949 [34, p. 537]. The following changes are made. All species, hybrids, and horticultural varieties of sweet, sour, Mahaleb (*Prunus mahaleb*), and Bessey (*P. besseyi*) cherry, chokecherry (*P. virginiana*), peach, nectarine, almond, apricot, plum, Japanese plum (*P. salicina*), and Damson plum (*P. insititia*) imported from the United States, including trees and propagating material, must be accompanied by a certificate establishing that the nursery of origin was inspected during the growing season and is believed to be free from certain virus diseases. For cherry stock destined for British Columbia, the certificate must cover albino cherry [28, p. 408], cherry buckskin [loc. cit.], pink fruit [14, p. 288; 23, pp. 391, 392], and little cherry [35, pp. 200, 689]; that entering other provinces must, in addition, be free from cherry twisted leaf virus [29, p. 313]. For other *Prunus* stock the certificate must cover phoney peach [33, p. 488], peach mosaic [35, p. 285], yellow leaf roll [loc. cit.], peach yellows [cf. 32, p. 224], and little peach [30, p. 329], if the stock is for British Columbia, and the first three diseases only if destined for other provinces.

All species, hybrids, and horticultural varieties of fruit trees, including trees and propagating material of apple, apricot, cherry, nectarine, peach, plum, prune, and quince, from countries other than the United States must be accompanied by a certificate establishing that the material has been inspected and is free from such virus diseases as may be designated from time to time. These requirements do not apply to *Prunus* and *Pyrus* stock imported for scientific purposes under special permit.

Wheat imported from any country in Europe, from Illinois, Kansas, Washington, and Missouri, as well as from Australia, Asia, Africa, and Chile, unless required for scientific purposes, must be accompanied by a certificate attesting that the locality where it was harvested was free from flag smut (*Urocystis tritici*) [cf. 33, p. 406]. Wheat from Washington, Wyoming, Montana, Idaho, Utah, Oregon, and New York imported for scientific purposes is exempted from the certification requirement with reference to dwarf bunt (race of *Tilletia caries*) [*T. controversa*].

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 3, 8, p. 127, 1955.

Proclamation No. 63 (Union of South Africa) of 14th February, 1955, published in the Government Gazette, Vol. 179, No. 5426, 4th March, 1955, amends Proclamation No. 286 of 1936 [16, p. 640] and prohibits the importation of plants and seeds of sunflower from Brazil, Argentina, the Union of Soviet Socialist Republics, Uganda, and any other country where the virus disease known as mosaic occurs.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 3, 10, pp. 157–158, 1955.

A list is given of the plant diseases and pests enumerated in an Order of the Federal Executive Council (Yugoslavia) of 28th December, 1954, published on that date in the Službeni List No. 54. The Order forbids the entry into Yugoslavia of any plants infected or infested thereby.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 3, 12, pp. 189–191, 1955.

A Greek ministerial decree published in the *Ephemeris tes Kuberneseos* 315, 1954, deals with phytosanitary legislation concerning plant importations. Prohibition of importation and passage in transit applies to citrus, cooking potatoes, and cotton and lucerne seed from all sources endangering introduction of tristeza virus [map 289], *Synchytrium endobioticum* [map 1], *Glomerella gossypii* [map 317], and

lucerne dwarf virus [map 262], respectively, and to all plants from Texas, U.S.A. Other plant imports as listed must be accompanied by phytosanitary certificates, varying in their requirements. Ports of entry are specified, also special conditions for plant importations by institutions and agriculturists.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 4, 3, pp. 44–45, 1955.

A Guatemalan Plant Protection Act published in *El Guatemalteco* 68, 1955, empowers the authorities concerned to make plant diseases notifiable when necessary and includes phytosanitary legislation regarding plant imports.

Notification F. 6–18/53-Dte. 1 published in *Gaz. India* 45, 1954, amends regulations concerning the importation into India of potatoes, which except from Burma may enter by sea only at Bombay or Madras, and must be covered by an amended certificate.

By a proclamation of 13th July, 1955, *Rosa* species from Australia, New Zealand, and Italy may enter Mauritius only if certified as from an area where rose wilt virus does not occur.

Plant quarantine announcements.—*F.A.O. Pl. Prot. Bull.*, 4, 5, pp. 73–74, 1956.

The Danish Order of April, 1953 [33, p. 278], as amended in April, 1956, prohibits the importation of pine plants from North America and requires certification that potatoes are free from *Corynebacterium sepedonicum* and that fruit trees and shrubs and ornamental woody plants have been obtained from virus-free sources.

An Egyptian order of February, 1955, specifies conditions for the importation of plants, including phytosanitary certification.

Morwood (R. B.). **A preliminary list of plant diseases in Fiji.**—*Agric. J. Fiji*, 27, 1–2, pp. 51–54, 1956.

This list of plant diseases recorded in Fiji, prepared from published records and from observations, has already been noticed in this *Review* [cf. 36, p. 3]. Nearly 300 diseases are listed under 67 hosts.

Ivor (D.). **Provincial agricultural legislation in the Atlantic Provinces, 1956.**—63 pp., Canada Department of Agriculture Marketing Service, Economics Division, Ottawa, 1956. [Mimeographed.]

Statutes of the Provinces of Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick which relate to agricultural matters, including plant protection, and were on the statute books on 1st July, 1956, are classified according to their subject-matter and briefly summarized (together with any amendments to them) in non-legal, non-technical language.

Orellana (R. G.). **Cacao diseases in Haiti.**—*F.A.O. Pl. Prot. Bull.*, 4, 10, pp. 148–151, 2 figs., 1956.

In Haiti most of the cacao is in the southern peninsula and of the Forastero-Trinitario complex. In a survey of both the northern and southern peninsulas, made from 14th to 28th January, 1956, no clear case of virus disease was found. In the southern peninsula, no great difference in susceptibility to the ubiquitous *Phytophthora palmivora* was observed, nor was trunk canker found, possibly in the absence of the Criollo strain [33, p. 593].

At Baliverne and La Vallette, a condition of senile trees was present which resembled the witches' broom malformations found in Jamaica [35, p. 276]; a species of *Mycena* was associated.

A physiological disorder commonly present was characterized by a conspicuous

marginal chlorosis of the leaves reminiscent of potassium deficiency. A form of sickle leaf accompanied by a marked interveinal chlorosis was probably due to zinc deficiency.

Thielaviopsis spp. caused brown, sunken pod lesions covered by white to creamy spores. Anthracnose was caused by *Colletotrichum gloeosporioides* [*Glomerella cingulata*: cf. 35, p. 753]. Some minor cases of thread blight (*Pellicularia* spp.) were observed.

In the northern peninsula *P. palmivora* appeared to be more widespread under shade, and the brooming disease was not found.

Spicher (G.). **Vergleichende Untersuchungen über die Mikroflora des Getreides.** [Comparative studies on cereal microflora.]—*Zbl. Bakt.*, Abt. 2, 109, 23–25, pp. 589–610, 16 graphs, 1956.

The examination at the Federal Research Institute for Cereal Manufacture, Detmold-Lippe, Germany, of 113 rye and 153 wheat samples with average moisture contents of 17·5 and 16·9 per cent., respectively, revealed 37,500 and 26,900 [unspecified] mould spores per gm., respectively [cf. 36, p. 16]. The corresponding numbers of bacteria were 1,575,000 and 3,045,000, respectively.

Azbukina (Mme Z. M.). Специализация ржавчинных грибов на культурных злаках Приморского края в стадии уредо. [Specialization of rust fungi on cultivated cereals of the littoral region in the uredo stage.]—Бот. Матер. (*Not. syst. Sect. crypt. Inst. bot. Acad. Sci. U.S.S.R.*), 11, pp. 150–161, 1956.

A field survey of the cereals and grasses in the littoral region of the extreme oriental U.S.S.R. from 1949 to 1951 showed that of the nine species of rust fungi on cultivated cereals, the ones attacking a wide range of hosts were: *Puccinia graminis* on wheat, rye, oats, *Phleum pratensis*, *Poa pratensis*, and *Beckmannia syzigachne*; *Puccinia persistens* on wheat, rye, *Agropyron repens*, and *Clinelymus sibiricus*; and *P. coronifera* [*P. coronata*] on oats, *Agrostis alba*, *Alopecurus pratensis*, and *B. syzigachne*. Six f. spp. of *P. graminis* are recognized, four of *P. coronata*, three of *P. persistens* (*tritici* on wheat, *secalis* on rye, and *agropyri* on *Agropyron repens*), and one of *P. poae-sudeticae* (f. *poae* n. f. on *Poa pratensis*, *P. compressa*, *P. palustris*, and *P. trivialis*). *Puccinia poae-pratensis* on *Poa pratensis* and *Puccinia rangiferina* on *A. repens* and *C. sibiricus* are new records for the U.S.S.R. Cross-inoculation experiments with these species and *P. rangiferina* showed that the specialization of the first three under the conditions of the littoral region differs significantly from that of the same species in the Khar'kov region of the Soviet Union and in Western Siberia. *P. rangiferina* from *Critesion jubatum* attacked rye, barley, and wheat.

Toko (H. V.) & Bruehl (G. W.). **Apple-grain and English grain aphids as vectors of the Washington strain of the cereal yellow-dwarf virus.**—*Plant Dis. Reptr*, 40, 4, pp. 284–288, 1 fig., 1 diag., 1956.

At the Washington Agricultural Experiment Station, Pullman, *Rhopalosiphum fitchii*, *Macrosiphum granarium*, and *Toxoptera graminum* all effectively transmitted the cereal yellow dwarf virus [35, p. 440] to oats, wheat, and barley in the greenhouse. A higher percentage of infection and more severe symptoms resulted from inoculation by means of *R. fitchii* than by *M. granarium* even though a common source of the virus was used.

Lupton (F. G. H.). **Resistance mechanisms of species of Triticum and Aegilops and of amphidiploids between them to Erysiphe graminis DC.**—*Trans. Brit. mycol. Soc.*, 39, 1, pp. 51–59, 1 pl., 10 figs., 1956.

At the Plant Breeding Institute, Cambridge, seedling leaves of a number of species and amphidiploids of *Triticum* and *Aegilops* were inoculated with conidia

from a single race of *Erysiphe graminis* [cf. 34, p. 362]. Three distinct mechanisms for preventing the further development of the pathogen were displayed by resistant lines. The fungus germinated and produced appressoria on the leaves of *T. carthlicum*, *T. dicoccum* var. *farrum* and s.sp. *georgicum*, *T. timopheevi*, and *A. caudata* but was unable to penetrate the epidermal wall. In *A. ovata* penetration took place normally but three or four days later haustoria and mycelium degenerated and died. The third type of resistance was displayed by *A. speltoides*, in which the penetrating hypha burst on entering the host cell and killed it. When the epidermis is not penetrated staining with cotton blue produces a halo at the point of entry, suggesting that 'bruising' has occurred and that the resistance is physical. Chemical or nutritional factors only intervene after penetration has occurred.

Cenoz (H. P.) & Vallega (J.). **Razas fisiológicas de 'Puccinia coronata avenae' en la región cerealera Argentina.** [Physiologic races of *Puccinia coronata avenae* in the Argentine cereal belt.]—*Rev. Invest. agríc., B. Aires*, 9, 4, pp. 325–339, 2 graphs, 6 maps, 1955. [English summary. Received 1956.]

A revised series of oat varieties for the classification of the physiologic races of *Puccinia coronata* [cf. 35, p. 761] enabled the authors to subdivide the four groups in Argentina [30, p. 518] formerly known as Arg. 1, 45, 55, and 56 into 22 distinct races of which 13 (238, 237, 225, 244, 236, 230, 226, 227, 260, 287, 261, 277, and 278) corresponded to Arg. 1 (affecting neither Bond nor Victoria), five (203, 265, 263, 276, and 262) to Arg. 45 (Bond but not Victoria), 279 and 213 to Arg. 55 (both varieties), and 258 and 259 to Arg. 56 (only Victoria).

Tests made with the selections Magnif. 29 (Tama × Santa Fe) and Magnif. 28 (Klein Mar × Santa Fe) confirmed that the combination of resistance factors carried by Victoria and Bond controls the pathogenicity of all the races of *P. coronata* at present known in Argentina.

Vallega (J.), Cenoz (H. P.), Tessi (J. L.), Frecha (J. H.), & Rodríguez Amieva (P. J.). **Importancia de las enfermedades de los cereales en 1954 y comportamiento de variedades cultivadas de Trigo, Avena y Cebada.** [Importance of cereal diseases in 1954 and reaction of cultivated varieties of Wheat, Oats, and Barley.]—*Bol. Inst. Fitotec. Castelar* 3, 17 pp., 6 maps, 1955. [Mimeographed.]

The following information is included in this detailed survey of cereal diseases in Argentina in 1954 [34, p. 775]. Incidence was highest in the north of the cereal region. The most widespread disease of wheat was caused by *Puccinia rubigo-vera tritici* [*P. triticina*], the average infection reaching 12·46 per cent. Incidence of *Septoria tritici* (9·75 per cent.) was the highest for six years, and that of *P. graminis* (2·66) the lowest for the same period. Diseases of oats, barley, and flax did not reach serious proportions.

Arg. races 11, 15, and 17 of *P. graminis* were detected on wheat, the first showing an increase over previous years. A new biotype, characterized by its virulence on Magnif. G., was encountered in race 17. Of the Argentine race groups of *P. triticina*, 20 (UN 9) continued to predominate, with 15 (UN 2) in second place; 77 (UN 13) and 5 (UN 5) occurred occasionally.

On oats *P. coronata avenae* Arg. 1 (races 225, 226, 236, 237, 238, 244, and 277) was by far the most widespread, followed by Arg. 45 (races 203, 262, 263, 265, and 276). Race 213 in Arg. 55 was also encountered. The few specimens analysed showed no trace of race 4 of *P. graminis*, but races 3 and 7 were detected. The biotype of 3 attacking Saia [loc. cit.] occurred again. Of *P. hordei* on barley, only race UN 14 was encountered.

ROJAS M. (E.). **Algunos aspectos de la raza 15 B de Puccinia graminis tritici en el Perú.** [Some aspects of race 15 B of *Puccinia graminis tritici* in Peru.]—*Bol. trim. Exp. agropec.*, 4, 4, pp. 2–5, 1955. [Received November, 1956.]

At La Molina Agricultural Experiment Station, Peru, four biotypes of race 15 B of *Puccinia graminis* [34, p. 217] were identified on wheat from various parts of the country. In tests against the most virulent of these, 15 B–2 P or 189, the following selections were resistant [cf. 35, pp. 5, 664]: Z–52 (M.E.×Kenya 58), 18–52 (Klein 40 C 9606×Kenya 58), 29–52 (Garnet×Kenya 58), 63–53 (Reward H 44×Rhodesian C. 12273), 104–53 (M.E.×H 44–Marquis C.I. 11782), and 84–52 (M.E.×A.V. 18/1.1.1.1.1.).

KNOTT (D. R.) & ANDERSON (R. G.). **The inheritance of rust resistance. I. The inheritance of stem rust resistance in ten varieties of common Wheat.**—*Canad. J. agric. Sci.*, 36, 3, pp. 174–195, 1956.

In plant breeding work at the University of Saskatchewan, Saskatoon, the inheritance of resistance to races 15 B and 56 of wheat stem rust (*Puccinia graminis*) [35, pp. 81, 160, 815] and the inter-relationship of the resistance genes were studied in ten wheat varieties. Seedling tests in the greenhouse and field tests were made on F_2 populations from diallel crosses and on the families from backcrosses to the susceptible variety Marquis. Genes were detected governing (*a*) a hypersensitive reaction to both races in Kenya 58, Red Egyptian, and McMurachy; (*b*) resistance to 15 B in Kenya 58, Kenya 117 A, and Egypt Na 95; (*c*) moderate resistance to both races in Red Egyptian; (*d*) moderate resistance to race 56 in Red Egyptian, Kenya 117A, and Egypt Na 95; (*e*) resistance to race 56 in Kenya 117 A and Egypt Na 95; and (*f*) resistance to race 56 in Gabo, Lee, and Timstein (two complementary genes).

JOHNSON (T.). **Physiologic races of leaf rust of Wheat in Canada 1931 to 1955.**—*Canad. J. agric. Sci.*, 36, 5, pp. 371–379, 4 graphs, 1956.

Investigations at the Plant Pathology Laboratory, Winnipeg, Manitoba, on the distribution of the physiologic races of leaf rust (*Puccinia triticina*) of wheat [35, p. 288] in the three geographical areas of Canada showed that it has followed a distinct pattern in each, races 58 and 76 being predominant in Eastern Canada, 5, 9, 15, 126, and 128 in the Prairie Provinces, and 1 and 11 in British Columbia. It is shown that in the Prairie Provinces wheat varieties grown there and in the adjacent parts of the United States strongly influenced the prevalence of races and pathogenic strains of races. Thus, from 1937 to 1954, when varieties with the type of resistance of Hope and H 44–24 were widely grown, these exerted a strong selective action on the rust, resulting in increasing susceptibility due to the selection of pathogenic strains of certain physiologic races. A similar selective effect now seems to be due to the new variety Lee.

The possible influence of geographical barriers on race distribution are indicated and present methods of determining leaf rust strains to facilitate the breeding of resistant varieties are noted.

MEINERS (J. P.), KENDRICK (E. L.), & HOLTON (C. S.). **Depth of seeding as a factor in the incidence of dwarf bunt and its possible relationship to spore germination on or near the soil surface.**—*Plant Dis. Reptr*, 40, 3, pp. 242–243, 1956.

In plot trials conducted by the Field Crops Research Branch, Pullman, Washington, the highest percentages of dwarf bunt (*Tilletia controversa*) [cf. 35, p. 8] of Orin wheat in naturally infested soil developed when the seed was sown near the surface or at a depth of 1 in., infection decreasing with increasing depth down

to 4 in. The incubation period for the germination of dwarf bunt spores applied in a heavy suspension to the soil surface ranged from one to six weeks, indicating that a critical combination of environmental factors (probably moisture, temperature, and light) at soil level determines the rate of germination.

Blair (I. D.). **The present situation concerning Wheat smut diseases.**—Reprinted from *N.Z. Wheat Rev., 1953, 1954, 1955*, 7 pp., 2 pl., [? 1956.]

Although covered smut of wheat (*Tilletia caries* and *T. foetans* [*T. foetida*]) is no longer active in New Zealand [30, p. 560] infection is still latent and preventive dusting is necessary. The cost is estimated at £11,250 per year for 120,000 acres sown at 1½ bush. per acre. Results since 1950 show a general improvement in dusting efficiency, more than 80 per cent. of samples now being well dusted as against a previous average of 50 per cent.

For the control of loose smut (*Ustilago tritici*) [19, p. 643] nucleus lines of seed are treated with hot water at the Department of Scientific Research and grown in the following season on leased land by the Department of Agriculture. Cross 7 is also grown by the Canterbury Agricultural College. Seed thus multiplied is available as certified pedigree wheat; this produces certified mother seed, which in turn is multiplied to give certified standard seed, three times removed from the treated seed.

Wehrle (Valerie M.) & Ogilvie (L.). **Spread of take-all from infected Wheat plants.**—*Plant Path.*, 5, 3, pp. 106–107, 1 diag., 1956.

On 1st November, 1949, Holdfast wheat was sown at Bristol in soil which was free from take-all (*Ophiobolus graminis*) [cf. 35, p. 753]. On 16th January, 1950, groups of three infector plants (naturally infected wheat seedlings washed free from soil) were introduced into the plot at five points. Examination at the end of August showed that considerable spread of the disease, up to some five feet, had occurred across as well as along both the 7 in. and 10 in. drills.

Sallans (B. J.). **Trends of common root rot of Wheat in Saskatchewan.**—*Canad. J. agric. Sci.*, 36, 4, pp. 292–301, 4 graphs, 1 map, 1956.

Surveys carried out in nine districts in Saskatchewan showed that the increase in root rot of wheat (*Helminthosporium sativum* [*Cochliobolus sativus*] and *Fusarium* spp. [27, p. 229; 35, p. 8]) during the period 1934 to 1953 was related to a number of factors influencing growth, such as weather, particularly rainfall, the cropping practice whereby the percentage of land bearing susceptible crops was first reduced and then increased, and the more extensive use of straw and stubble mulch. Conditions resulting in an average crop yield of less than 16 bush. per acre favour root rot and a similar, though less marked, increase in the disease occurs with yields of over 20 bush.

Bose (S. R.). **Alternaria within the pericarp of the Wheat seed.**—*Nature, Lond.*, 178, 4534, pp. 640–641, 1956.

At the Botanical Laboratory, Carmichael Medical College, Calcutta, wheat seedlings, grown aseptically from seed treated in hot water (53·4° to 54° C.) for ten minutes to destroy *Alternaria tenuis* in the pericarp grew poorly in comparison with similar seedlings from surface-sterilized seed in which *A. tenuis* was allowed to develop normally [cf. 31, p. 177; 34, p. 445].

In February, 1955, a severe outbreak of leaf spot caused by a species of *Alternaria* not yet determined occurred on durum wheat at the Cuttack Central Rice Research Institute, Orissa, and caused an almost complete loss of crop, but common wheat varieties were unaffected. It is pointed out that a slight change in environment might bring about a parasitic relationship from a symbiotic one.

Parisinos (J.). **Wheat and Barley production in Cyprus. (Part II.)**—*Countryman, Nicosia, 1956*, pp. 12–13, 1 fig., 1956.

The following diseases are reported from Cyprus [cf. 35, p. 509] to be important on wheat: *Puccinia graminis tritici* [32, p. 670], causing appreciable losses in years of severe epidemics, and of which five races (14, the most prevalent, 17, 24, 53, and 117) have been isolated, *Helminthosporium sativum* [*Cochliobolus sativus*], and *Pyrenophora* [*tritici-*] *repentis*. On barley the most important is *H.* [*P.*] *teres*, followed by *Erysiphe graminis hordei* and *Puccinia hordei*.

Wells (D. G.). **Downy mildew on Wheat and Barley.**—*Plant Dis. Reptr*, 40, 3, p. 258, 1956.

During the 1955 season downy mildew (*Sclerospora macrospora*) [35, p. 424] was found in two localities in Mississippi. Attacks were severe on Anderson and ? Chancellor wheat, less severe on Kenbar and Manchuria barley, and slight on an unidentified variety of oats.

Vallega (J.), Cenoz (H. P.), Favret (E. A.), Sarasola (J. A.), de Sarasola (M. D. R. C.), Tessi (J. L.), & Frecha (J. H.). **Comportamiento de algunas Cebadas con respecto a la raza '14' de 'Puccinia hordei' Otth.** [Reaction of certain Barleys to race 14 of *Puccinia hordei* Otth.]—*Rev. Invest. agríc., B. Aires*, 9, 3, pp. 187–200, 1 graph, 1955. [English summary. Received 1956.]

Puccinia hordei was first observed on barley in Argentina [34, p. 775] in 1930 but virtually disappeared from 1934 to 1950. As a result of its widespread incidence since 1951, however, field and greenhouse tests were started for the selection of resistant varieties and all the 5,000 varieties in the world collection have been examined. The best resistance was shown by Abyssinian C.I. 1243, Arquipa, Bolivia C.I. 1257, Quinn C.I. 1024, and Peruvian C.I. 935. Some resistant varieties also possessed good resistance to other parasites, e.g., Abyssinian C.I. 1243 to *Helminthosporium* [*Pyrenophora*] *teres* [loc. cit.], Monte Cristo C.I. 1017 to *Erysiphe graminis* [26, p. 151], and Osiris C.I. 1622 to *Rhynchosporium secalis* [34, p. 775]. Argentine varieties were in general susceptible to *P. hordei*, but Forrajera R.M. 85, Hoyo de Epuyen (DIV 2508), and San Carlos (DIV 5000) showed low infection averages.

Millerd (Adèle) & Scott (K.). **Host pathogen relations in powdery mildew of Barley. II. Changes in respiratory pattern.**—*Aust. J. biol. Sci.*, 9, 1, pp. 37–44, 4 graphs, 1956.

In further studies conducted at the University of Sydney, New South Wales, on host-pathogen relations in powdery mildew of barley (*Erysiphe graminis*) [34, p. 362], an investigation was made of the respiratory activity of healthy and experimentally infected plants of the following varieties: B 49 Kinner (susceptible); Cape (susceptible); B 167 (resistant); B 69 (semi-resistant); and B 278 (highly resistant), grown under glass at 25° to 30° C. and inoculated seven days after planting. The respiration studies were conducted at 30°.

The evidence obtained showed that in highly resistant barley strains there was a very rapid biochemical response to the presence of the ectoparasite. The respiration rate increased rapidly, followed by the early collapse of the affected cells and return to a normal rate. In the susceptible strain increased respiration continued parallel with fungal growth. Infected resistant and semi-resistant strains developed a respiratory pattern correlated with the time and extent of cell collapse, increased respiration occurring invariably in advance of this.

The respiratory pattern is explained as being the resultant of two opposing forces: as the cells collapsed the respiration rate tended to return to normal, but

this was counteracted by the increased respiration that resulted from continuing fungal growth and its effect on further leaf cells. All the recorded changes, both biochemical and histological, may be explained by postulating that the presence of the pathogen or the host-pathogen combination results in the formation of an agent which, either directly or indirectly, uncouples the respiration from the concomitant phosphorylations that normally limit its rate. Attempts are to be made to elucidate the nature of this agent.

ANDREWS (J. E.). **Inheritance of reaction to loose smut, Ustilago nuda, and to stem rust, Puccinia graminis tritici, in Barley.**—*Canad. J. agric. Sci.*, 36, 5, pp. 356–370, 2 pl., 1956.

Studies were carried out at the University of Minnesota on the inheritance of reaction to two races, designated Vr and Vs, of loose smut (*Ustilago nuda*) [33, p. 225] and races 56 and 15 B of stem rust (*Puccinia graminis tritici*) [34, p. 592] in crosses between the barley varieties Anoidium, Valentine, and Montcalm. The resistance of Valentine to race Vr, as shown by F_1, F_2, F_3, and backcross progenies, was controlled by a single dominant gene and that of Anoidium by a single recessive gene, designated un7, the two genes being independent. The resistance of Anoidium to race Vs, as seen in two crosses and one backcross, appeared to be due to a single dominant gene. Deviations from this hypothesis in a third cross may have been due to greater mortality of resistant than of susceptible genotypes.

In crosses with the resistant Valentine, mature plant reaction to race 56 and seedling reaction to race 15 B of *P. graminis tritici* were controlled by a single gene with resistance dominating. Greenhouse temperatures between 80° and 85° F. proved satisfactory for differentiating between resistance and susceptibility to stem rust, whereas those between 65° and 70° were not.

A link was found between the genes for resistance to stem rust and to race Vr of *U. nuda* in Valentine, the recombination value obtained from backcross and F_3 data being $9{\cdot}2 \pm 1{\cdot}8$ per cent.

WILSON (V. E.). **Host reaction to Helminthosporium victoriae and related species.**—Abs. in *Iowa St. Coll. J. Sci.*, 30, 3, pp. 456–457, 1956.

The possibility that a species of *Helminthosporium* in the southern United States, which causes a culm rot of oats (especially those resistant to *H. victoriae*), is distinct from *H. sativum* [*Cochliobolus sativus*], though resembling it [cf. 35, p. 442], was studied at the Iowa Agricultural Experiment Station. Ten representative sporulating cultures were selected from 75 *Helminthosporium* isolates obtained from naturally infected oats and barley, isolates 1, 2, 3, and 4 exemplifying *H. victoriae*, 5, 6, 7, and 8 culm rot, and 9 and 10 *C. sativus*. In the experimental results and morphological comparison, however, 1 to 4 formed one general *H. victoriae* group and 5 to 10 resembled *C. sativus*, no characteristics being found to separate the culm rot isolates. Isolates within species and among closely related species were shown to vary in requirements for normal growth, and pathogenicity tests with varieties of oats and barley revealed host specificity contrary to that previously reported for *H. victoriae* and *C. sativus*.

GRIFFITHS (D. J.) & PEREGRINE (W. T. H.). **Halo blight of Oats.**—*Plant Path.*, 5, 3, pp. 95–97, 2 figs., 1956.

The appearance of halo blight (*Pseudomonas coronafaciens*) on oats at Aberystwyth, Wales [34, p. 769], is further described. In 1955 symptoms appeared in the field in early June on the upper leaves, approximately three weeks before flowering. Infection was uniformly distributed throughout the crop, the mean percentage of plants infected being 3·93 and the mean percentage of plants with infected heads

1·85. In at least 50 per cent. of the infected panicles examined in the experimental plots the amount of seed set was reduced by half and the over-all mean percentage reduction in seeds set for all infected panicles was 40·7. In a crop with 10 per cent. panicle infection this would represent a grain loss of about 4 per cent. Although the season was very dry, considerable infection occurred in the field under observation and the disease remained active while the crop was green.

A feature of the spread of the disease was the occurrence of panicles of severely infected plants which emerged as a sticky mass. Neighbouring plants showed typical lesions on the glumes only, with no leaf or stem infection, and had probably become infected by bacteria disseminated from the severely diseased panicles, which at this stage appeared to be exceptionally attractive to insects.

Observations indicated that varieties with compact heads are much more susceptible to damage of the panicles than those with a more open type of inflorescence [cf. 25, p. 145].

Gerretsen (F. C.). **Mangaangebrek bij Haver in verband met fotosyntese.** [Manganese deficiency in Oats in relation to photosynthesis.]—*Landbouwk. Tijdschr., Wageningen*, 68, 9, pp. 756–767, 2 figs., 3 graphs, 1956. [English summary.]

Experiments at the Agricultural Experiment Station and Soil Science Institute, Gröningen, the Netherlands, showed the carbon dioxide assimilation of manganese-deficient oats [33, p. 103] to be less than half that of normal ones. Lack of carbohydrates due to insufficient photosynthesis is considered to be responsible for nearly all the apparently unrelated symptoms of manganese deficiency or grey speck. Redox-potential measurements of illuminated leaf suspensions suggested strongly that manganese is an integral part of the oxidation-reduction mechanism of the photo-synthetic apparatus.

Among some 200 lines of oats grown on manganese-deficient soils, the Scottish varieties Ayrline, AA 734, Borris opus, Onward, and Fyris made better growth and gave higher yields than six others (including Star). The average hourly carbon dioxide uptake of the resistant group was 31·8 mg. per 100 sq. cm. and that of the susceptible 16·4. However, where acute manganese deficiency prevailed even the former were stunted, developed typical grey-speck symptoms, and ultimately died. The root systems of the resistant varieties, both in water cultures and in soil without manganese, were generally more vigorous than those of the susceptible.

Kybal (J.) & Brejcha (V.). **Problematik der Rassen und Stämme des Mutterkorns Claviceps purpurea Tulasne.** [Problems of the races and strains of ergot, *Claviceps purpurea* Tulasne.]—*Pharmazie*, 10, 12, pp. 752–755, 1955.

At the Drug Plant Research Institute, Prague, Czechoslovakia, five 'races' (recognizable by a standard content of certain fixed alkaloids in constant proportions when the sclerotium is vegetatively reproduced) of rye ergot (*Claviceps purpurea*) were separated, of which (I) was rich in ergotamine, (II) in ergotamine, ergocornine, and ergocristine, (III) in ergotamine, ergocornine, ergocristine, and ergocryptine, (IV) in ergocornine, ergocristine, and ergocryptine, and (V) in ergocornine and ergocristine. Ergonovine and ergosine were present in all the sclerotia examined. The purity of the 'races' was demonstrated by inoculation experiments on rye, which resulted in the production of sclerotia of identical composition.

Total alkaloid yields are probably dependent on the performance of individual strains within a race [cf. 34, p. 224], and the development of high-yielding, homogeneous strains by monoconidial isolation is planned.

Kulkarni (U. K.). **Initiation of the dicaryon in Puccinia penniseti Zim.**—*Trans. Brit. mycol. Soc.*, 39, 1, pp. 48–50, 1 fig., 1956.

During a study of *Puccinia penniseti*, the agent of leaf rust of bajra (*Pennisetum*

typhoides) [35, p. 673] at the Maharashtra Association for the Cultivation of Science, Poona, India, the initiation of the dicaryon was observed and took place by cell fusions between uninucleate, irregularly polygonal cells in the primary aecidial primordia. No nuclear migrations were observed at any stage in the development of the aecidial primordia.

Moreau (C.). **Les composés organiques du bore (albotènes), leur intérêt dans le traitement des Agrumes en entrepôt.** [Organic boron compounds ('albotenes') and their efficiency in the treatment of Citrus fruits in storage.]—*Fruits d'outre mer*, 11, 9, pp. 375–379, 2 graphs, 1956.

Further studies of damage sustained by citrus fruits in storage in France [35, p. 447] revealed that sporulation of *Penicillium digitatum* and *P. italicum* was prevented by treatment with 10 per cent. solutions of organic compounds of boron known as 'albotenes', which caused no necrosis of the fruit. Loss of weight by the fruit after three months' storage was reduced from 10 per cent. to 0·9 per cent. Mist spraying with 80 per cent. solutions caused an eightfold reduction in the quantity of fungal spores in the atmosphere of the store.

Kaufman (J.), Hardenburg (R. E.), & Lutz (J. M.). **Weight losses and decay of Florida and California Oranges in mesh and perforated polyethylene consumer bags.**—*Proc. Amer. Soc. hort. Sci.*, 67, pp. 244–250, 1956.

In a comparison at Beltsville, Maryland, oranges purchased at local wholesale markets and kept in perforated polyethylene bags at 70° F. for seven days had more decay (average 12 to 19·3 per cent.) than those in mesh bags (7·3), all stored loose. These figures were slightly higher for bags stored in a shipping carton. The only type of decay developing in California-grown oranges was *Penicillium* rot [*P. digitatum* and *P. italicum*: 35, p. 511] while Florida-grown oranges were attacked in addition by stem-end rots (*Phomopsis* [*Diaporthe citri*] and *Diplodia* [*natalensis*]). If polyethylene bags are used they should be perforated with 64 $\frac{1}{4}$-in. holes per 5 lb. bag.

Dry stem of Valencia Oranges.—*Agric. Gaz. N.S.W.*, 67, 5, pp. 257–258, 1 fig., 1956.

Losses in New South Wales from dry stem of Valencia orange are occasionally high enough to cause concern. The condition is due to the formation of an abscission layer where the fruit stalk joins the parent twig, and under humid conditions *Diaporthe citri* [cf. 35, p. 3] may then invade the fruit. Dry stem is due to a lack of adequate water supply to the mature fruit, inducing premature senescence.

Graniti (A.). **Morfologia di Deuterophoma tracheiphila Petri e considerazioni sul genere Deuterophoma Petri.** [Morphology of *Deuterophoma tracheiphila* Petri and considerations on the genus *Deuterophoma* Petri.]—Reprinted from *Boll. Accad. gioenia*, Ser. 4, 3, 3, 18 pp., 5 pl., 1955. [French and English summaries.]

In studies at the Institute of Plant Pathology, University of Catania, Sicily, on naturally infected branches of field cultivated orange, lemon, and various citrus hybrids, some characters of *Deuterophoma tracheiphila* [34, p. 780] were found to differ from those described by Petri and others [10, p. 182; 25, p. 444]. The pycnidia were globose, spheroid, pyriform or ellipsoid, scattered or seriate, measuring 60 to 135 by 45 to 110 μ. They had a roughly cylindrical, conical, or claviform neck up to 250 μ long and 45 to 70 μ wide, with an ostiole terminating in a pore 3 to 8 μ in diameter. On the same branches, however, the forms described by Gassner [20, p. 398] and by Goidànich and Ruggieri [27, p. 318] were also seen. There were occasional instances of 'astomate' pycnidia, but none of the structures described by Petri, most of whose observations seem to have been made on artifici-

ally cultured material. The pycnidia studied by the author differed from those described by Petri in a number of ways, which are described.

It is concluded that (1) these new data on *D. tracheiphila* modify Petri's views on the genus *Deuterophoma*, (2) the genus may be accepted as distinct from *Blastophoma*, and (3) its diagnosis and that of *D. tracheiphila* both require modification.

Outbreaks and new records. Italy.—*F.A.O. Pl. Prot. Bull.*, 4, 10, p. 157, 1956.

Grafting tests carried out at the Station of Fruit and Citrus Cultivation, Acireale, Palermo, Sicily, demonstrated that the tristeza virus [36, p. 22] was present in Satsuma mandarin oranges. All the trees tested carried the virus and were destroyed.

Childs (J. F. L.). **Transmission experiments and xyloporosis-cachexia relations in Florida.**—*Plant Dis. Reptr*, 40, 2, pp. 143–145, 1956.

Studies at the Horticultural Crops Research Branch, Orlando, Florida, showed that while the causal agent of citrus cachexia (probably a virus) [35, p. 823] was rarely, if ever, transmitted through seed of Orlando tangelo, the causal agent of xyloporosis (probably the same virus) [35, p. 763] was transmitted through 20 of 30 sweet lime seeds. Preliminary results indicated the transmission of cachexia through the seed of rough lemon; this, however, needs confirmation.

Wallace (J. M.). **Tristeza disease of Citrus, with special reference to its situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 4, 6, pp. 77–87, 6 figs., 1956.

After noting the present geographical distribution of tristeza disease of citrus [map 289] and briefly reviewing the history of the disorder [cf. 13, p. 436; 20, p. 400], the author presents a succinct account in semi-popular terms, with 46 references to the literature, of the economic importance, symptoms, insect vectors, and origin of the disease, varietal resistance to it, and its diagnosis and control [cf. 27, p. 132; 28, p. 522; 35, pp. 447, 764, *et passim*].

McClean (A. P. D.). **Tristeza and stem-pitting diseases of Citrus in South Africa.**—*F.A.O. Pl. Prot. Bull.*, 4, 6, pp. 88–94, 5 figs., 1956.

A brief account is given in semi-popular terms of tristeza and stem-pitting diseases of citrus in South Africa [30, p. 267; 34, p. 640], the main points dealt with being the effects of these conditions on sweet orange, grapefruit, tangerine, lemon, and the rootstocks, the nature of the virus infection prevalent in South African citrus trees, and control.

The solution of the problem probably lies in the use of nucellar seedlings instead of budded plants. Such seedlings possess juvenile vigour and are initially free from infections possibly present in the parent. Early decline in the Natal tight-skinned 'naartjie' (variety of tangerine) when budded on rough lemon has become much less prevalent since it has been grown on its own roots.

Costa (A. S.). **Present status of the tristeza disease of Citrus in South America.**—*F.A.O. Pl. Prot. Bull.*, 4, 7, pp. 97–105, 3 figs., 1956.

This survey of the present situation as regards tristeza disease of citrus in South America [cf. 30, p. 410; 32, pp. 184, 480, *et passim*] deals with the economic importance of the disease, its history in the area, varietal reaction, rootstock recommendations, and tristeza problems in relation to grapefruit and West Indian limes, suggesting the possible protection of these by mild strains of the virus [cf. 35, p. 447]. A bibliography of 41 titles is appended, most of which have been noticed in this *Review*.

Mendel (K.). **The threat of tristeza disease in the Mediterranean Basin.**—*F.A.O. Pl. Prot. Bull.*, 4, 7, pp. 106–108, 1956.

The danger of tristeza virus of citrus to the Mediterranean area is discussed. The presence of this disease in the Meyer lemon in Israel [36, p. 23] has now been confirmed, but in the absence of a vector it has not spread. Cecily grapefruit, a tristeza virus carrier introduced into Cyprus, has been eradicated. The author, however, considers the possible danger of a change in the nature of the virus, enabling its transmission by a new vector. Precautionary measures, therefore, should include a check for the virus of every citrus variety introduced into the Mediterranean area in the last 20 years (Egyptian lime [*Citrus aurantiifolia* var.] is as suitable an indicator as West Indian lime), trials of suitable new rootstocks, development of nucellar strains, and strict quarantine measures.

Kovachich (W. G.). **Necrotic spotting of the Oil Palm by Cercospora elaeidis Steyaert.**—*Trans. Brit. mycol. Soc.*, 39, 3, pp. 297–300, 2 figs., 1956.

The symptoms of necrotic spotting of adult oil palms [? in the Belgian Congo: cf. 34, p. 720] are described. This is probably the most common foliar disease of plantation oil palms and is usually most severe on the two lower whorls. The earliest signs of infection are minute brown spots, each surrounded by a small, water-soaked area on the under surface of the leaflets. Following enlargement of the area along the intercostal tissue the central brown spot increases in size and the water-soaked area turns yellow, then orange. Mature spots consist of a round, brown area 3 to 4 mm. in diameter, surrounded by an oval orange halo about 10 by 4 mm. Cultures from the spots were identified as *Cercospora elaeidis* [34, p. 147], morphologically indistinguishable from the fungus causing leaf spot of nursery oil palms [35, p. 449]. Inoculation experiments established the existence of two strains of *C. elaeidis* causing the two distinct syndromes on seedling and adult oil palms. Both types of spotting were observed on some three-year-old oil palms.

The presence of *Oplothecium arecae* on old disease spots is noted and a description given of the perithecia and asci.

Costa (A. S.), Franco (C. M.), Silva (D. M.), Lazzarini (W.), & Fraga (O. G.). **Nova moléstia do Cafeeiro na região de Garça: a mancha aureolada.** [A new Coffee disease in the Garça region: halo spot.]—*Bol. Suptda Serv. Café, S. Paulo*, 30, 343, pp. 37–43, 1955. [Received November, 1956.]

A new disease of coffee, which has been designated halo spot, has caused considerable damage on new plantations in the Garça region of São Paulo, Brazil. Varieties affected are chiefly Mundo Novo and Bourbon Amarelo, but also Bourbon Vermelho and Caturra. Symptoms include necrotic lesions surrounded by a yellow halo on leaves at all stages of growth, complete defoliation of infected branches except for very young leaves at the extremities, scorching and drying up of the extremities of numerous branches, and necrosis of new fruit.

Investigations to determine the causal agent are proceeding. Although the necrotic symptoms, particularly on old leaves, bear some resemblance to those caused by potassium deficiency, the similarity of the yellow halo to wildfire [*Pseudomonas tabacum*] of tobacco and halo blight [*P. medicaginis* f.sp. *phaseolicola*] of bean indicates a bacterial cause, and this is the explanation favoured by the authors.

Protective control by general application of chemicals is considered impractical for so extensive a region, and investigations are being made to ascertain whether resistance can be induced by nutritional modification.

Loué (A.). **Études sur la nutrition minérale du Caféier en Côte d'Ivoire.** [Studies on the mineral nutrition of Coffee in the Ivory Coast.]—*Bull. spéc. Cent. Rech. agron., Bingerville*, 68 pp., 14 pl. (6 col.), 3 graphs, 1955. [Received June, 1956.]

In the second chapter of this work (pp. 13–21), descriptions (accompanied by a number of useful plates, some in colour) are given of the symptoms developing on the leaves of Robusta coffee seedlings grown at the Agricultural Research Station, Bingerville, French West Africa, in nutrient solutions variously lacking in nitrogen [34, p. 453], phosphorus [18, p. 22], potassium [32, p. 20], calcium [18, p. 21], magnesium [30, p. 156], sulphur [loc. cit.], iron [34, p. 722], manganese (omission of this nutrient induced no symptoms), and boron [33, p. 688].

Reyes (B. M.). **Resultados preliminares de un estudio comparativo de fungicidas en el control del 'ojo de gallo' (Omphalia flavida Rangel) en almácigos de Cafeto.** [Preliminary results of a comparative study of fungicides in the control of 'cock's eye' (*Omphalia flavida* Rangel) in Coffee nurseries.]—*Bol. trim. Exp. agropec.*, 4, 3, pp. 15–17, 1 graph, 1956.

In preliminary spraying trials at Tingo Maria, Peru, against cock's eye (*Omphalia flavida*) [*Mycena citricola*] of coffee [cf. 35, p. 450] Bordeaux mixture (0·75 per cent.) and dithane Z-78 (1 lb. per 100 gals.) in seven applications from 20th October to 20th December gave good control, while cupra-vit (2 and 3 lb.) was less effective.

The author recommends dithane Z-78 both for its easy preparation and use, and because it contains zinc, which is deficient in the area.

Tarr (S. A. J.). **Stem canker (Macrophomina phaseoli) of Cotton seedlings in the Sudan Gezira.**—*Nature, Lond.*, 178, 4539, p. 935, 1956.

During the 1954–5 season seedling cotton growing in the central and southern Gezira, Republic of the Sudan, was severely attacked by stem canker (*Macrophomina phaseoli*) [cf. 35, p. 524] following an above-average rainfall. It is feared that the disease could become a major problem if earlier sowing of the crop were introduced.

Seedlings were successfully inoculated with *M. phaseoli*, using needle pricks in the green cotyledonary node, but not by spraying at the same stage with a culture of the pathogen.

Following soil fumigation with chloropicrin three to four weeks before sowing the percentages of cankered seedlings were 24 (using 10 gals. per acre), 32 (20), and 45 (40), compared with 24 (untreated). In plots fumigated with methyl bromide (15 per cent. at 20 gals. per acre) 22·5 per cent. of the seedlings were infected, while the figure for a soil drench of commercial formalin (160 gals. per acre) was 23·5 per cent. The final yield of cotton from chloropicrin-fumigated plots was 32 to 48 per cent. higher than from the untreated, more than offsetting the initial heavier losses from *M. phaseoli*.

It is thought that the sclerotia of *M. phaseoli* are resistant to chloropicrin and consequently flourish when other micro-organisms are killed, increasing the incidence of stem canker, and this supports the hypothesis that the carry-over of the fungus locally is by sclerotia. This did not apply to soils treated with methyl bromide or formaldehyde.

Revilla (V. A.). **La condición fitopatológica del cultivo del Algodonero en los Valles del Chira y Piura en la campaña 1955.** [The phytopathological condition of Cotton cultivation in the Valleys of Chira and Piura in the 1955 season.]—*Inf. Estac. agríc. La Molina* 98, 12 pp., 9 figs., 1 map, 1955. [English summary. Mimeographed.]

This is an interesting and largely pioneer study of the phytopathological

condition of the cotton fields in the Chira and Piura Valleys of northern Peru in 1955.

Varieties grown are Piura, Acala, and Karnace, and a selection from Piura named Direx. The following diseases are prevalent: bacterial blight (*Xanthomonas malvacearum*), newly recorded in Peru [35, p. 890], basal stem rot (*Sclerotium rolfsii* [map 311], also a new Peruvian record for this host, powdery mildew (*Erysiphe malachrae*) [15, p. 18], *Alternaria* leaf spot (*A. tenuis*) [loc. cit.], boll spot (*Helminthosporium gossypii*) [loc. cit.], wilt (*Fusarium vasinfectum*) formerly attributed to *Verticillium albo-atrum* [18, p. 25], and damping-off (*Rhizoctonia* [*Corticium*] *solani*) [34, p. 646].

Wolcott (G. N.). **Experiences with entomogenous fungi in Puerto Rico.**—*Bull. P.R. (ins.) agric. Exp. Sta.* 130, 19 pp., 6 figs., 1955. [Spanish summary.]

Some of this information on the control of insect pests by entomogenous fungi in Puerto Rico has been noticed from another source [34, p. 647]. Extended periods of rainfall or high humidity at tropical temperatures appear essential for effective control. Under such conditions there are records of the complete destruction of *Icerya purchasi* on citrus by *Spicaria javanica* [cf. 5, p. 97], of *Sipha flavida* on sugar-cane by *Acrostalagmus* [*Verticillium*] *aphidum*, and of *Anticarsia gemmatilis* on cowpea and velvet bean [*Mucuna deeringiana*] by *Spicaria rileyi* [15, p. 719].

Mayo (G. M. E.). **Linkage in Linum usitatissimum and in Melampsora lini between genes controlling host-pathogen reactions.**—*Aust. J. biol. Sci.*, 9, 1, pp. 18–36, 1 graph, 1956.

The author adduces evidence in support of his view that the work of H. H. Flor on the genetics of disease resistance in higher plants with special reference to flax rust (*Melampsora lini*) [26, pp. 488; 31, p. 489], though making some important suggestions, establishes less than is claimed for it. The weakness of Flor's evidence, it is considered, shows the need for more critical tests for allelism and linkage of the genes between both host and pathogen.

Ray blight of Chrysanthemums.—*Agric. Gaz. N.S.W.*, 67, 6, pp. 308–309, 2 figs., 1956.

Ray blight (*Mycosphaerella ligulicola*) [imperfect state: cf. 29, p. 215] of chrysanthemum first appeared in New South Wales in 1955, causing heavy losses, especially in the early varieties. Weekly spraying with zineb at 6 oz. per 20 gals. is recommended.

Grouet (Mme D.). **Essais de traitements contre Entyloma dahliae Sydow.** [Trials of treatments against *Entyloma dahliae* Sydow.]—*Phytiatrie-Phytopharm.*, 5, 1, pp. 33–39, 2 graphs, 1956.

In 1954 and 1955 trials of fungicides to control *Entyloma dahliae* [35, p. 100] were carried out in France with the susceptible dahlia variety Mme Elizabeth Sawyer, at Marcoussis, using natural infection, and at Saint-Rémy-les-Chevreux, by artificial infection. Of the fungicides used, captan gave the most consistently satisfactory results, 0·25 per cent. active material being significantly more effective than 0·125 per cent. in one of the trials.

Vukovits (G.). **Eine gefährliche Gloxinienkrankheit.** [A dangerous disease of Gloxinia.]—*Pflanzenarzt*, 9, 11, pp. 105–106, 2 figs., 1956.

A stem and leaf rot caused by *Phytophthora parasitica* and *P. cryptogea* are reported as causing a serious disease of gloxinias in Austria [cf. 23, p. 390]. The disease resembles tomato foot rot due to *P. cryptogea*; soft rot and blackening of the stem appear at ground-level and the disease rapidly spreads upwards. The

tubers are seldom affected. The use of Cheshunt compound is recommended for control.

Johnson (B. L.) & Barnhart (D.). **Transfer of mosaic resistance to commercial varieties of Matthiola incana.**—*Proc. Amer. Soc. hort. Sci.*, 67, pp. 522–533, 2 figs., 1 graph, 1956.

At the University of California, Los Angeles, the resistance of accession 589, a strain of the Christmas Red variety of *Matthiola incana*, to stock mosaic virus [31, p. 491] was found to be determined by a single recessive gene. Two procedures are described for transferring mosaic resistance from accession 589 to other commercial stock varieties and at the same time recovering a balanced sterility mechanism for producing double-flowered plants, not possessed by 589.

Milbrath (J. A.) & Young (R. A.). **Cucumber mosaic virus and Alfalfa mosaic virus isolated from Daphne odora.**—*Plant Dis. Reptr*, 40, 4, pp. 279–283, 4 figs., 1956.

In recent years many plantings of *Daphne odora* in the Pacific Northwest have displayed leaf mottle symptoms. At the Oregon Agricultural Experiment Station, Corvallis, strains of cucumber mosaic virus [33, p. 406] were isolated from all the 45 *D. odora* plants tested, whether apparently healthy or diseased, and lucerne mosaic virus was isolated from at least 15. The viruses were identified on the basis of reaction in cucumber, Bountiful bean [*Phaseolus vulgaris*], broad bean, and cowpea, and on cross-protection tests. Several strains of each virus were distinguished.

Walker (J.). **Further recorded diseases of Clovers in New South Wales.**—*Agric. Gaz. N.S.W.*, 67, 7, pp. 353–357, 5 figs., 1956.

A number of new clover diseases have recently been found in New South Wales [cf. 34, p. 726]. Rot caused by *Sclerotinia* sp. [cf. 35, p. 661] was reported on crimson clover in the Murrumbidgee Irrigation areas in 1955. Burn caused by *Sphaerulina trifolii* [loc. cit.] was recorded on *Medicago denticulata* and strawberry clover (*Trifolium fragiferum*). Control seems at present unnecessary.

The only bacterial disease of clover known in the State is leaf blight (*Pseudomonas syringae*), which attacked red clover severely at Oberon.

In late 1955, a stunting disease of *T. subterraneum* was widespread in south-eastern Australia. Diseased plants had small, curled centre leaves and there was a red and yellow discoloration of the outer leaves. The agent is suspected to be a virus.

Lee (C. L.). **Virus-tumor development in relation to lateral-root and bacterial-nodule formation in Melilotus alba.**—*Virology*, 1, 1–3, pp. 152–164, 17 figs., 1955. [Received November, 1956.]

In investigations at the University of Illinois, Urbana, it was found that root tumours in *Melilotus alba* plants infected with wound-tumour [big vein] virus [35, p. 77] were generally initiated in the pericycle near young lateral roots. No callus was formed round the emerging lateral roots. When a lateral-root primordium grew out, some cells round its base were torn, but the tumours arose from the apparently normal pericycle cells. Some tumour cells were found in the vascular strands of the nodules and, rarely, in the nodule cap. It is possible that growth-regulating substances may diffuse inwards from the nodule cells and stimulate the formation of a tumour by the virus-containing tissue underneath.

Karimov (M. A.). Новые виды грибов на **Medicago sativa L.** в Узбекистане. [New species of fungi on *Medicago sativa* L. in Uzbekistan.]—Бот. Матер. (*Not. syst. Sect. crypt. Inst. bot. Acad. Sci. U.S.S.R.*), 11, pp. 118–131, 12 figs., 1956.

During a recent survey of fungal diseases of lucerne in Uzbekistan, U.S.S.R., 59 species were recorded. Twelve are new to science and are here described. They were found mostly on stems of the previous year or on dead stems and included *Mycosphaerella medicaginis*, affecting leaves and stems previously infected with *Cercospora medicaginis*; *Metasphaeria medicaginis*, *Pleospora medicaginis*, *Phoma medicaginicola*, *Diplodia medicaginicola*, and *P. coccum*; *D. consocians* and *Sphaeronema medicaginis* on stored stems previously affected by *Ascochyta imperfecta*; *Mycosphaerella medicaginicola*, occurring simultaneously with and possibly the perfect state of *C. medicaginicola*, which produces spots on the leaves similar to those caused by *C. medicaginis* and has conidia 50 to 300·9 by 4 to 6 μ; and *Heterosporium medicaginis*, producing dark brown spots with a dark olive, velvety cover on the living leaves and having conidia, the unicellular measuring 7·6 to 27·8 by 7·76 μ, the bicellular 10 to 20·2 by 7·6 to 10·1 μ, and the 3- to 4-celled 15·2 to 25·3 by 8·5 to 11·8 μ.

Anderson (H. W.). **Diseases of fruit crops.**—vi+501 pp., 93 figs., New York, McGraw-Hill Book Company, Inc., 1956. 64*s*.

This useful book contains an introductory chapter dealing with causal agents, identification, and control, followed by four chapters on diseases of pome fruits, two on stone fruits, and one each on brambles, grapes, strawberries, gooseberries and currants, cranberries, and blueberries. Citrus and other subtropical fruits are not included. The emphasis is on conditions in the United States and Canada. Non-parasitic disturbances with well-defined symptoms are included and selected references are appended after the account of each disease.

Sooty blotch and flyspeck.—*Agric. Gaz. N.S.W.*, 67, 6, pp. 304–305, 4 figs., 1956.

Sooty blotch (*Gloeodes pomigena*) [28, p. 210] and fly speck (*Leptothyrium pomi*) [loc. cit.] of apple are fairly common in New South Wales in seasons of high rainfall, and also affect pears and citrus. In general, control by the black spot (*Venturia inaequalis*) spray programme is effective, but Washington Navel oranges and grapefruit can be sprayed with Bordeaux mixture 3–3–80 plus 0·5 gal. white oil in the spring. Brushing of citrus fruit is also fairly effective, but bleaching with calcium hypochlorite is better and less damaging. The fruit should be dipped for 1½ minutes in a solution of 4 oz. chloride of lime, 4 oz. boric acid OR, 3 oz. sodium bicarbonate, and 1 gal. water.

Lewis (G. D.). **Botryosphaeria canker and fruit rot of Apple in New York.**—*Plant Dis. Reptr*, 40, 3, p. 228, 1956.

Botryosphaeria ribis [35, p. 379] was found causing canker on most of the apple varieties grown in southern New York during the summer of 1955 and is believed to have been present in one orchard since 1950. Less susceptible varieties were McIntosh and Rhode Island Greening and very few cankers were found on Golden Delicious, Red Delicious, and Gallia Beauty. The only varieties with fruit rot were Red and Golden Delicious. Most of the Red Delicious fruits became infected through the calyx, the decay extending to the carpel region and eventually reaching the surface of the fruit.

Shutak (V. G.) & Christopher (E. P.). **Storage scald control by orchard applications of mineral oil.**—*Proc. Amer. Soc. hort. Sci.*, 67, pp. 80–81, 1956.

During 1953–4 and 1954–5 storage scald in Cortland apples [32, p. 680] was reduced considerably by a single spray of 5 per cent. mineral oil plus triton X 100 emulsifier, one week before harvest, at Rhode Island Agricultural Experiment Station, Kingston. The appearance of the fruit was not adversely affected and leaf injury was only one or two per cent.

Burrell (A. B.), Boynton (D.), & Crowe (A. D.). **Boron content of Apple in relation to deficiency symptoms and to methods and timing of treatments.**—*Proc. Amer. Soc. hort. Sci.*, 67, pp. 37–46, 4 graphs, 1956.

At Cornell University, Ithaca, New York, the boron content of mid-terminal leaves from McIntosh apple trees with deficiency symptoms [24, p. 404] averaged 13 p.p.m.; soil applications of boron compounds raised this by 200 per cent. in one year and 138 in another. The boron content of fruits from deficient trees was 3 to 5 p.p.m. and was increased 400 per cent. by soil treatments.

Two borax sprays (2 lb. per 100 gals.) one and three weeks after petal-fall were more effective for the current year than one soil treatment (autumn or spring) in a band round the tree, and this more than broadcast application. But in the subsequent years trees receiving soil treatment had slightly more boron than the sprayed when the applications were not repeated.

An inverse relationship existed between boron and nitrogen contents in apple leaves.

Stony-pit of Pears.—*Agric. Gaz. N.S.W.*, 67, 6, pp. 305–307, 4 figs., 1956.

Stony pit virus of pear [34, p. 284] has recently appeared in the Lakesland and Orange districts of New South Wales. Varieties affected are Williams Bon Chrétien, Clapp's favourite, Beurré Bosc, Packham's Triumph, and Howell. In advanced stages the lower bark of the trees cracks. There is no direct control, but top-working to Williams Bon Chrétien, which is less affected, may be a palliative. No vector has been found.

Willison (R. S.) & Dustan (G. G.). **Fruit flies and fungal wastage in Peaches.**—*Canad. J. agric. Sci.*, 36, 3, pp. 233–240, 1956.

Experiments conducted over a period of three years by the Science Service, Canada Department of Agriculture, Ottawa, Ontario, showed that infestation by fruit flies(*Drosophila* spp.)increased wastage due to brown rot(*Monilinia* [*Sclerotinia*] *fructicola*) and black mould (*Rhizopus nigricans*) [*R. stolonifer*] in peaches [35, p. 421] held in baskets for more than three or four days after harvest, provided there was some external source of inoculum. In the absence of the flies, placing rotted fruits within 2 ft. of the baskets had no effect on incidence, the percentages of brown rot starting at the stem-end being 44 on Veteran and 66 on Elberta, a variety notoriously susceptible to stem-end injuries at harvest, as against 60 and 84, respectively, when the flies were present. Sulphur sprays applied to the trees according to the recommended schedule were superior to captan in controlling brown rot and had some repellent effect on the flies.

Black mould usually appeared after the fruit was ripe and was transmitted very efficiently by the flies from outside sources of inoculum. If it was already present when the fruit was picked, but not on the external source, the flies had little effect on its dissemination and in such cases captan gave better control than sulphur.

Burgaud (L.). **Les fongicides organiques de synthèse dans la lutte contre la cloque du Pêcher (Taphrina deformans Tul.).** [Synthetic organic fungicides in the

control of Peach leaf curl (*Taphrina deformans* Tul.).]—*Phytiatrie-Phytopharm.*, 5, 1, pp. 17–20, 1956.

In a comparative spraying test carried out at Limonest, in the Rhône valley, 13 plots each containing six seven-year-old J. H. Hale peach trees were sprayed against leaf curl (*Taphrina deformans*) [35, p. 530] on 22nd February, 1955, at the swollen bud stage with commercial products containing, respectively, 50 per cent. captan, 60 per cent. zineb, 70 per cent. ziram, 70 per cent. ferbam, 75 per cent. thiram, 50 per cent. copper oxychloride, 35 per cent. basic copper sulphate; 37·5 per cent. copper oxychloride plus 15 per cent. zineb, and 70 per cent. wettable sulphur. One plot was sprayed with 2 per cent. Bordeaux mixture, and one with a product containing 23·3 per cent. copper and 16·5 per cent. ziram. A further plot remained untreated. On 19th March, at the pink bud stage, three trees in each sprayed plot were given a further application of the original spray. Each application was made at the rate of 1·5 l. per tree. During the period from 5th to 11th May, 1955, counts of healthy and infected leaves were made over a length of a metre on two of the main branches of each tree (one facing north, and one south). It was then found that a single application of the different treatments had given, respectively, 0·96, 11·84, 0·15, 0·23, 0·61, 2·42, 2·6, 8·89, 4·97, 2·1, and 0·33 per cent. infected leaves. The corresponding figures for two applications were 0·35, 5·87, 0·15, 0·4, 0·12, 0·2, 0·27, 4·98, 2·47, 0·49, and 0·34 per cent. Infection on the untreated controls amounted to 35·2 per cent. It is concluded that ziram, ferbam, thiram, and captan are more active against *T. deformans* on peach than are copper compounds, that zineb is less effective, and that one application at the end of the dormant period suffices to give almost complete control.

Gourley (C. O.). **Black knot on Peach in Nova Scotia.**—*Plant Dis. Reptr*, 40, 3, pp. 231–232, 1 fig., 1956.

Dibotryon morbosum caused black knot of peach trees in Nova Scotia during the summer of 1954. The soft, knot-like swellings on the wood were similar to those described on cherry and plum [cf. 33, p. 708], this apparently being the first record of the fungus on peach. The conidia, produced sparingly, were slightly larger than those of the plum fungus. Only a few perithecia and ascospores were found in nature, the ascospores being identical with those on other hosts.

Jensen (D. D.). **Insect transmission of virus between tree and herbaceous plants.**—*Virology*, 2, 2, pp. 249–260, 2 figs., 1956.

At the University of California the author transmitted to celery, by means of the leafhopper *Colladonus geminatus*, peach yellow leaf roll virus [strain of peach western X-disease virus], Napa buckskin virus from cherry, Green Valley buckskin virus from cherry and peach, and a strain related to the last from cherry. All four viruses produced similar symptoms four to six weeks after infection, the first being chlorosis of the youngest and stiffening of the oldest leaves, on the appearance of which growth almost ceased, particularly in the heart of the plant. Within a few weeks after this the entire plant became chlorotic and flaccid, the root system collapsed, and death ensued. These symptoms developed in 94 out of 108 tested plants.

Yellow leaf roll virus was transmitted back to peach by the same vector after a relatively short acquisition feeding period of three days. Evidence, including similarities of vector relationships and symptoms, is cited to support the view that peach yellow leaf roll is a strain of the cherry buckskin virus group [peach western X-disease virus]. Western aster yellows virus produced no symptoms in 54 peach trees fed upon by infected leafhoppers, though the same leafhoppers infected all of nine celery plants.

Hobart (O. F.). **Introduction and spread of necrotic ring spot virus in sour Cherry nursery trees.**—Abs. in *Iowa St. Coll. J. Sci.*, 30, 3, pp. 381–382, 1956.

In further studies at the Iowa Agricultural Station on [peach ring spot] necrotic ring spot virus in sour cherry nursery blocks [35, p. 377] *Prunus tomentosa* showed the presence of virus in 96·8 per cent. of infected *P. mahaleb* trees indexed on it. Six of 15 plum scion varieties were shown to contain virus when indexed on Montmorency cherry and *P. tomentosa*, and there was also proof of virus transmission through *P. americana* seeds [cf. 35, p. 464], 19 of 43 thickets showing infection. Transmission through artificial root grafts was demonstrated between *P. americana*, *P. mahaleb*, and *P. avium*, and by various intra-varietal root grafts, but such do not occur in the field.

Glasscock (H. H.) & English (W. S.). **Control of Black Currant leaf spot by spraying with oil-Bordeaux mixture.**—*Plant Path.*, 5, 3, pp. 97–98, 1 fig. (between pp. 94 and 95), 1956.

In spraying trials begun in 1952 in a nursery in East Sussex, Westwick Choice and other black currant bushes were sprayed against leaf spot (*Pseudopeziza ribis*) [35, p. 201] for three successive years with oil-Bordeaux mixture applied either immediately after flowering, immediately after picking, or after both. In 1954 the mean yields of ripe fruit from four bushes for the three treatments were, respectively, 46·6, 46·5, and 82·6 oz., as against only 24 oz. for the unsprayed controls.

While oil-Bordeaux mixture controls the disease, increases the weight, and improves the quality of the crop, fruit for processing, in which the maximum content of vitamin C is to be retained, is generally rejected after spraying with copper. However, a single annual application immediately after picking should control moderate infection and might leave insufficient residue to jeopardize acceptance of the following year's crop.

Cadman (C. H.). **Modes of transmission and field spread of Raspberry virus.**—Abs. in *Trans. Brit. mycol. Soc.*, 39, 3, pp. 382–383, 1956.

In this review of the spread of raspberry viruses [cf. 35, p. 874] in Great Britain, presented to the Society at a meeting on 14th October, 1955, the author notes that the principal vector of aphid-transmissible raspberry viruses in this country is *Amphorophora rubi*. Rates of spread of these viruses are slow and commercial varieties differ widely in resistance to them, but are all more resistant than the North American black raspberry, *Rubus occidentalis*. The annual increase of vein-banding virus in an experimental plot of Lloyd George was two-fold, spray control of aphids reducing this to one-tenth.

Raspberry viruses which are transmissible mechanically but not by aphids include the Scottish leaf curl virus [35, p. 618] and cause ring spot diseases on a number of hosts. They are apparently soil-borne. The annual rate of spread in Scottish plantations is also two-fold. Lloyd George and Malling Landmark seem immune from these viruses, though most commercial varieties are either killed or much weakened by them.

Goode (Pamela M.). **Infection of Strawberry roots by zoospores of Phytophthora fragariae.**—*Trans. Brit. mycol. Soc.*, 39, 3, pp. 367–377, 1 pl., 3 figs., 1 graph, 1956.

This is an amplified account of studies on the infection of strawberry roots by *Phytophthora fragariae* at the Botany Department, University of Birmingham, which have already been noticed [35, p. 112]. The most favourable environment for ensuring a long period of motility in zoospores was provided by non-sterile

pond water at 13° to 14° C. and pH 6·0 to 6·8, under which conditions the zoospores remained motile for up to five hours. Production of sporangia was retarded and depressed by sterilization of the pond water by heat or Seitz-filtering and was inhibited altogether in distilled water.

Zoospores of *P. fragariae* encysted readily on the roots of immune, resistant, and susceptible strawberry plants, on strawberry roots killed by boiling water, and on the roots of non-host plants, but very rarely on strands of wool or fine glass rods. Encystment took place in the root hair zone and at root tips. Germination of cysts trapped in the root hair zone was quite haphazard, the germ-tubes pointing in all directions and not penetrating the root or root hairs, while in the root tip zone, in both non-host plants and strawberries, the germ-tubes penetrated directly into the host tissue, indicating response to a stimulus. Penetration, however, did not extend beyond the epidermal layer except in susceptible strawberry varieties, when the fungus reached the differentiating stele within three days, and was there confined to the phloem and pericycle.

ZUCKERMANN (B. M.) & BAILEY (J. S.). **A new gall disease of the cultivated highbush Blueberry.**—*Plant Dis. Reptr*, 40, 3, pp. 212–216, 2 figs., 1956.

A new root-gall disease of the cultivated highbush blueberry [*Vaccinium* sp.] was first observed by the grower in 1953 and by the authors in 1955 near Freetown, Massachusetts. Of the highly susceptible Pioneer, Cabot, and Wareham bushes, 73 per cent. developed infection or died during three years, while Jersey, Rubel, and Dixi showed high resistance. The root galls are white and coriaceous when young, becoming dark brown, woody, and covered with bark. Basal stem cankers occasionally extend upwards for 12 to 18 in. Woody galls are sometimes associated with the cankers and small galls may occur on the fruiting twigs. The symptoms differ from all other known disease symptoms on this host [cf. 32, p. 25].

The manner of spread in the field and preliminary inoculation studies suggest that the disease is infectious, but the cause is still unknown.

Atti del Convegno Nazionale di Fitopatologia, Reggio Calabria, 20–21 Marzo, 1956. [Proceedings of the National Convention of Phytopathology, Reggio Calabria, 20–21 March, 1956.]—*Notiz. Malatt. Piante, 1956*, 37–38 (N.S. 16–17), pp. 1–285, 2 pl., 1 map, 1956.

At this Convention [cf. 35, p. 658], A. CICCARONE (pp. 71–89) succinctly reviewed, in the light of 79 references to the relevant literature, the present state of knowledge concerning nutritional disorders of olive trees prevalent in Italy, including non-parasitic gummosis of the aerial parts and roots [cf. 32, p. 574] associated with unfavourable soil conditions, decline or leptonecrosis [35, p. 834], and boron deficiency [loc. cit.].

G. RUGGIERI (pp. 169–174), discussing the control of mal secco disease of citrus (*Deuterophoma tracheiphila*) [36, p. 98], described a further experiment carried out at the Citrus Experiment Station, Acireale, Sicily, in which 3,000 sour orange seedlings were sprayed once a month for four months with 1 per cent. solution of caffaro powder in water plus the sticker 'cano' at 250 gm. per 100 l., beginning at the end of October, 1953. Subsequent infection amounted to 12 per thousand, as against 430 for untreated seedlings. The S. Teresa clone of the resistant Femminello lemon, developed at Acireale, was stated to have replaced Monachello, as being superior.

C. SIBILIA (pp. 175–179) briefly reviewed the results obtained in experiments conducted since 1949 at the Station of Plant Pathology, Rome, on the control of vine downy mildew [*Plasmopara viticola*] by means of non-copper preparations [see above p. 84].

G. Martelli (pp. 181–197) described the organization of the Italian plant protection service and expressed the view that the functions of the vine-mildew warning system established in northern Italy [cf. 32, p. 605] should be integrated and extended.

A. Graniti (pp. 201–206) stated that from spraying experiments conducted near Cassaro, Syracuse, Sicily, for the control of olive 'leprosy' (*Gloeosporium olivarum*) [36, p. 39] he concluded that the period of infection depends on climatic factors, especially moisture and temperature. Infection usually begins when the fruits have turned black, in the second half of October, and continues throughout the autumn, becoming much less prevalent when the minimum daily temperature falls below 10° C. In seasons when the late summer and early autumn are mild and damp, the fruits may become infected while still green.

F. Russo and G. Raciti (pp. 207–216) described the symptoms of zinc, manganese, and iron deficiency in citrus and the cure of these conditions by the usual methods.

Georghiou (G. P.). **The Olive leaf spot and its control.**—*Countryman, Nicosia, 1956*, p. 8, 3 figs., 1956.

At the Kykko Metochi groves, Nicosia, Cyprus, in 1955–6 Bordeaux mixture (10–10–100) applied in the second half of October, just before the rainy season, effectively controlled leaf spot (*Cycloconium oleaginum*) of olives [35, p. 510]. When the season is unusually rainy another application in the second half of December is recommended.

Hamilton (R. A.). **A preliminary report on effects of soil application of crag fungicide 974 on growth of Papaya plants.**—*Proc. Amer. Soc. hort. Sci.*, 67, pp. 298–301, 1 fig., 1956.

In a field experiment at Poamaho Branch Station, University of Hawaii, Honolulu, in 1953 the average growth of young papaw plants (where development was poor) after five months in soil treated with crag fungicide 974 (200 lb. per acre) [35, pp. 768, 907] was 106·9 cm. compared with only 89·1 cm. for those in untreated soil, and the plants were greener and the stems thicker.

Marsh (R. W.). **Developments and uses of the newer agricultural fungicides and bactericides.**—*F.A.O. Pl. Prot. Bull*, 4, 8, pp. 113–116, 1956.

After pointing out that recent developments in agricultural fungicides have aimed at increasing toxicity to the fungus and decreasing injury to the host, the author briefly reviews and discusses the latest developments in the use of synthetic organic compounds and culture-derived antibiotics in the field on (*a*) seeds and soil, (*b*) stems and branches, and (*c*) leaves and fruit. He notes that both Bordeaux mixture and lime-sulphur have many merits and may well be used where spraying is still at an early stage of development, leaving the newer fungicides to be introduced later to meet special requirements.

Schicke (P.). **Untersuchungen über die Wirkung von Netz- und Haftmitteln auf die fungizide Wirksamkeit von 'Dithane'.** [Investigations on the effect of wetters and stickers on the fungicidal effectiveness of 'dithane'.]—*NachrBl. dtsch. PflSchDienst (Braunschweig), Stuttgart*, 8, 9, pp. 136–140, 2 graphs, 1956.

At the Plant Protection Laboratory of C. H. Boehringer Sohn, Ingelheim a. Rhein, Germany, 'dithane-cela' (containing 75 per cent. zineb) was tested for its activity against *Phytophthora infestans* on tomato [cf. 35, p. 401] alone and with resin soap (a sticker and wetter), alkaline salts of organic thio acids (wetter only), and soft soap (wetter only). Analysis of variance revealed no effect of the additives on the fungicide.

Probit analysis, however, revealed a levelling of the activity curves of the fungicide in the presence of the additives, and in agreement with this there is reported a field experiment in which a fall in the effectiveness of the fungicide against *Puccinia asparagi* infection of asparagus was associated with the use of soft soap.

It is concluded that sticker-wetters are for the most part unnecessary, but that wetters are perhaps justified where the advantages of wetting outweigh the possible lessening of fungicidal activity.

Fuchs (W. H.), Stellmach (G.), & Vogel (J.). **Teilchengröße und Wirkungsweise von Kupferpräparaten.** [Particle size and mode of action of copper preparations.]—*NachrBl. dtsch. PflSchDienst (Braunschweig), Stuttgart*, 8, 9, pp. 133–135, 1 fig., 1956.

At the University of Göttingen, Germany, when spray deposits of copper oxide and copper oxychloride on glass slides were tested for activity against spores of *Alternaria tenuis* it was found that toxicity was equal for particles of equal size, and diminished with increasing particle size. Under experimental conditions simulating continual light rain copper oxychloride deposits were more readily leached from glass slides than were those of copper oxide, irrespective of particle size [cf. 35, p. 206].

Potatoes were sprayed with these fungicides in field tests, samples from the upper foliage being removed after spraying and after each fall of rain to determine rainfastness. Copper oxide was more rainfast, and for both compounds rainfastness increased with diminishing particle size.

Tröger (R.). **Studien über die fungicide Kupferwirkung bei Fusarium decemcellulare.** [Studies of fungicidal copper action on *Fusarium decemcellulare*.]—*Arch. Mikrobiol.*, 25, 2, pp. 166–192, 11 figs., 1956.

The results of experiments at the Institute for General Botany of the Friedrich Schiller University, Jena, Germany, confirmed the conclusions of Villedieu and Villedieu regarding the 'contact action' of suspended basic copper fungicides [2, p. 374]. The conidia of *Fusarium decemcellulare* [*Calonectria rigidiuscula*] can germinate freely and the germ-tubes are able to develop for a time in a solution of ordinary Bordeaux mixture, the fungicidal effect of which operates only if the conidia come into contact with the suspended particles of the basic copper compound. However, the mechanism of the 'contact action' could not be elucidated by these studies. There was no difference in respect of copper uptake between conidia that had been in contact with the suspended particles or only with the solution, so that this factor at any rate cannot be responsible for the toxicity of the mixture.

Byrde (R. J. W.), Martin (J. T.), & Nicholas (D. J. D.). **Effect of fungicides on fungus enzymes.**—*Nature, Lond.*, 178, 4534, pp. 638–639, 1956.

Each of four fungicides was incorporated in a dextrose-peptone-phosphate liquid medium in an amount sufficient to produce a 50 per cent. inhibition of growth of *Sclerotinia laxa* (the agent of blossom wilt disease of fruit trees) at 25° C. in seven days, in studies at Long Ashton Research Station. Subsequent enzyme determinations with the mycelial mats showed that the iron enzymes were markedly depressed by lime-sulphur and aldolase was stimulated. Copper sulphate reduced aldolase and fumarase and stimulated diphosphopyridine nucleotide oxidase and hexokinase. Glutamic dehydrogenase was depleted by captan and diphosphopyridine nucleotide oxidase increased. The flavoprotein diphosphopyridine nucleotide oxidase system was inhibited by *o*-phenyl phenol.

It is hoped that work along these lines will lead to a more rational selection of fungicides for the control of specific diseases.

Firestone (D.) & Vollmer (P. J.). **Infrared determination of tetramethylthiuram disulphide in commercial dithiocarbamate formulations by the potassium bromide disk technique.**—*J. Ass. off. agric. Chem., Wash.*, 39, 3, pp. 866–872, 5 graphs, 1956.

An infra-red spectrophotometric method involving the application of the potassium bromide technique for the detection of thiram in commercial fungicides, e.g., arasan, thiram, and tuad, is fully described. It is based on the absorbance of the compound at 11·8 μ.

In the analysis of formulations containing other fungicides which interfere with the detection of thiram by absorbance at 11·8 μ, use is made of absorption bands beyond 12 μ, both as a corrective and to estimate the quantity of the additional ingredients.

Moore (W. C.). **Modern developments in crop protection.**—*J.R. agric. Soc.*, 116, pp. 20–28, 1955.

In this brief, popular survey of developments in crop protection over the past 15 years the author discusses crop rotation, insecticides, fungicides, seed treatments, weedkillers, application of sprays, official approval of proprietary products, health certification schemes, breeding for resistance, legislation, and co-operation between growers, officials, manufacturers, and traders [cf. 35, p. 224].

Kamat (M. N.). **Introductory plant pathology.**—vi+224 pp., 103 figs., Poona 2, India, Prakash Publishing House, 1956. Rs. 10 inland, 15*s.* overseas.

In the second textbook of this series [cf. 32, p. 493] the fundamental aspects of plant pathology are dealt with, completing a course in the subject for undergraduate students in Indian Universities. The first 15 chapters discuss the events leading up to the phenomenon of disease, the next four detail means of control, a chapter each is devoted to methods of disease study and taxonomy in general, and the last eight describe the major groups of plant pathogens, including bacteria, fungi, and viruses. Each chapter concludes with a list of references and at the end of the book a bibliography of 25 general works on the subject is included, together with a glossary of mycological terms.

Clifton (C. E.), Raffel (S.), & Stanier (R. Y.). **Annual review of microbiology. 10.**—426 pp., 3 pl., 4 figs., 1 graph, Palo Alto, California, Annual Reviews, Inc., 1956. $7.

In a discussion of the biology of the cellular slime moulds (*Acrasiae*) on pp. 21–50 of this publication M. Sussmann reviews present knowledge of the group, and covers the investigations of past years in the light of 73 references.

J. E. de Vay (pp. 115–140) deals with symbiotic and non-symbiotic relationships between fungi, with 132 references.

L. D. Wright (pp. 141–172) reviews the year's progress in the nutrition of bacteria and fungi, dealing, *inter alia*, with growth factors and anti-metabolite relationships (271 references).

H. Kern (pp. 351–368) surveys work in progress on the host-parasite relationship during the incubation period of disease, referring to growth and extension of the parasite in the host, pathogenic secretions of the parasite, and pathological alterations in the host (150 references).

G. Pontecorvo (pp. 393–400) discusses present knowledge of parasexual cycles in fungi [cf. 35, p. 871], covering the mechanism of the phenomenon and its significance, with 30 references.

Treggi (G.) & Bertini (S.). **Notizie su casi fitopatologici.** [Notes on phytopathological records.]—*Agricoltura ital.* 55, (N.S. 10), pp. 333–347, 3 figs., 1955.

This publication covers a survey by the Institute of Plant Pathology, University of Pisa, dealing with the symptoms and incidence in Italy of *Pleospora herbarum* on onion [cf. 35, p. 59] and garlic, followed by lists, with short notes on symptoms, of the principal cryptogamic diseases of these crops encountered in the field and in storage. Short accounts are also given of the diseases caused by *Alternaria dianthi* on carnation [32, p. 561], *Colletotrichum gloeosporides* [*Glomerella cingulata*] on tangerines [cf. 29, p. 616; 34, p. 717], *Alternaria tenuis* on chilli pepper [35, p. 574], and *Oidium hortensiae* on hydrangea [cf. 10, p. 32], concluding with a note on the damage caused by cold to William pears.

Kerr (A.). **Some interactions between plant roots and pathogenic soil fungi.**—*Aust. J. biol. Sci.*, 9, 1, pp. 45–52, 3 pl., 1956.

In work at the Waite Agricultural Research Institute, University of Adelaide, Australia, on brown patch (*Pellicularia filamentosa*) [*Corticium solani*: 32, p. 116; 35, p. 356] and dollar spot (*Sclerotinia homoeocarpa*) [loc. cit.] of turf, the pathogenicity of these fungi to radish, lettuce, beet, tomato, subterranean clover, pea, bean (*Phaseolus vulgaris*), and wheat seedlings was assessed by sowing seeds in inoculated and uninoculated soil and counting the emergence. The inoculations were carried out by mixing the fungi, after growth on sand-maize meal for ten days, with unsterilized soil at the rate of 2 gm. per 100 gm.

The results obtained indicated that *C. solani* (strain St 3) had a wide host range, tomatoes showing some resistance, peas more so, and beans being little affected. Most of the susceptible seedlings became infected in the pre-emergence stage, and of the few that emerged many were diseased. *S. homoeocarpa* also showed a wide host range but produced quite a different effect on its hosts. The seedlings that emerged were badly stunted, but showed no sign of penetration of the tissues by the fungus, except in the case of peas and beans. The effect of the organism on the other plants appeared to be due to the production of a toxin which prevented or retarded growth.

By means of a cellophane bag technique resembling that adopted by Dobbs and Hinson [32, p. 643], seeds of various hosts were placed in the bags, which were then partly buried for three days in soil (in a glass jar) inoculated with the appropriate fungus or left uninoculated as a control.

The seedlings from the bags buried with *S. homoeocarpa* were markedly stunted as compared with the controls. Some lettuce roots were necrotic but in no instance had the fungus penetrated the cellophane, nor was it obtained by plating the necrotic seedlings. *S. homoeocarpa* thus apparently produces a water-soluble substance, toxic to plants, that can diffuse through thin cellophane.

The bags buried in soil inoculated with *C. solani* contained either radish, lettuce, or tomato seeds and a conspicuous aggregation of hyphae of the fungus appeared on the outside surface directly opposite roots of radish and lettuce seedlings, but not of tomato, nor opposite the hypocotyls of any of them. Where aggregation was present, the radish roots were blackened and the lettuce roots very necrotic. Apparently the aggregation had been brought about by the outward diffusion of a substance or substances through the cellophane which had stimulated the growth of the fungus. The damage to the roots was due to the inward diffusion of a substance from the hyphae, which subsequently themselves penetrated the cellophane.

Stevenson (I. L.). **Antibiotic activity of actinomycetes in soil as demonstrated by direct observation techniques.**—*J. gen. Microbiol.*, 15, 2, pp. 372–380, 2 pl., 1956.

In further studies by the author at Rothamsted Experimental Station on the

effects of actinomycete antibiotics on *Helminthosporium sativum* [*Cochliobolus sativus*: 35, p. 759] eight actinomycete species were studied in soil and *in vitro*. The inhibition of spore germination in soil (as shown by a modification of Chinn's buried-slide technique) [33, p. 627] was correlated with that in culture. The effects of the actinomycetes on the vegetative growth of the fungus in soybean-supplemented soil, though varying with individual species, were with one exception similar to those obtained *in vitro*. Hyphal changes produced in soil included cessation of mycelial development, characteristic malformation, and lysis, the last occurring only in soil, apparently as a result of the antibiotic and an unidentified soil factor in combination. Similar effects were obtained in sterile and non-sterile soil, and production of antibiotics in unsupplemented soil was also demonstrated. Additional evidence of specific antibiotic action in soil was found in the similarity of the effects produced by *Streptomyces antibioticus* and by actinomycin, which is produced by this organism.

Antibiotic production in natural soil may be restricted to certain areas, such as the localized vicinity of concentrations of suitable carbon sources, and be too small to be detected by extraction.

Ferenczy (L.). **Antibacterial substances in seeds.**—*Nature, Lond.*, 178, 4534, pp. 639–640, 1956.

At the Department of Plant Physiology, University of Szeged, Hungary, the effect on bacteria of germinating seeds of 400 species and varieties of plants was tested by the agar-diffusion method (H. Köhler, *NachrBl. dtsch. PflSchDienst, Berl.*, 8, p. 1, 1954). *Fraxinus* spp. produced an inhibitor active against both Gram-positive and Gram-negative bacteria (*Erwinia carotovora* and *Xanthomonas malvacearum*). Altogether 36 species of seeds gave positive results against some or all of the eight test bacteria.

Orsenigo (M.), Orsenigo (Leda B.), & Zucca (Rita). **Attività antagonistica di Actinomyces griseus UC53/1 nei riguardi di vari funghi.** [Antagonistic action of *Actinomyces griseus* UC 53/1 on various fungi.]—*Ann. Fac. Agr.*, Ser. 2 (*Pubbl. Univ. S. Cuore*, N.S., 52), pp. 106–119, 9 figs., 1955.

In 1954 a strain of *Actinomyces griseus* was isolated at the Faculty of Agriculture of the University of the Sacred Heart, Milan, designated UC 53/1, and tested for antibiosis towards 174 different species of fungi and bacteria. Results showed sharp antagonistic action to the majority of the fungi, including *Macrophomina phaseoli* [cf. 34, p. 722], but none to the bacteria, and as the antibiotic also cannot be extracted with the more common organic solvents it must differ from actidione, grisein, streptomycin, or antibiotic 3510, all produced by *A. griseus*.

Thomas (R.). **Fungal cellulases. VII. Stachybotrys atra : production and properties of the cellulolytic enzyme.**—*Aust. J. biol. Sci.*, 9, 1, pp. 159-183, 3 figs., 15 graphs, 1956.

In further studies [cf. 32, p. 583] at the Biochemistry Unit, Wool Textile Research Laboratory, C.S.I.R.O., Melbourne, *Stachybotrys atra* grew well on a Waksman-Carey medium with cellulose as the sole carbon source, producing an extracellular cellulase, probably adaptive. Cellulase assay methods, in part new, are described.

The cellulase was active against a wide range of β-1,4′-polyglucosides extending from filter-paper to cellotriose. It had no effect, however, on highly crystalline cellulose (cotton duck) or cellobiose. It hydrolysed xylan but not chitin. The terminal products of the enzymic degradation of cellulose were cellobiose and glucose.

Barnes (R. A.) & Gerber (Nancy N.). **The antifungal agent from Osage Orange wood.**—*J. Amer. chem. Soc.*, 77, 12, pp. 3259–3262, 1955.

Osage orange (*Toxylon pomiferum*) [*Maclura pomefera*] was shown by studies at the School of Chemistry, Rutgers University, New Brunswick, New Jersey, to contain roughly 1 per cent. 2, 3′, 4, 5′-tetrahydroxystilbene. This compound proved to be toxic to five out of 13 micro-organisms tested *in vitro*, completely inhibiting the growth of *Myrothecium verrucaria*, *Pullularia pullulans*, and two dermatophytes, and limiting that of *Fusarium* [*oxysporum f.*] *bulbigenum*. Its presence is believed to be the main reason for the remarkable resistance of *M. pomifera* to decay [of unspecified origin].

Fraymouth (Joan). **Haustoria of the Peronosporales.**—*Trans. Brit. mycol. Soc.*, 39, 1, pp. 79–107, 5 figs., 1956.

Descriptions are given of the somatic structure of species of *Peronospora*, *Pseudoperonospora*, *Plasmopara*, *Bremia*, and *Albugo*. Some 46 species are referred to (including two of *Sclerospora*) and the nature of the haustoria and effects on numerous hosts considered. The haustoria of the last three genera are more specialized than those of the first two. The development of the haustoria is dependent upon the supply of food in the host, being relatively simple when this is plentiful. The structure and form of these haustoria are not correlated with the taxonomic position of either host or pathogen.

Sansome (Eva). **Camphor-induced gigas forms in Neurospora.**—*Trans. Brit. mycol. Soc.*, 39, 1, pp. 67–78, 3 figs., 1956.

At University College, Ibadan, Nigeria, cultures of *Neurospora crassa* [cf. 35, p. 85] were exposed to camphor vapour by placing camphor wrapped in cellophane above the cotton wool plug of the culture tube and covering the whole with aluminium foil. Unstable *gigas* forms were obtained by this method, and in crosses with these and normal strains asci with more than eight ascospores were formed. The observations made indicated that the *gigas* forms were diploid. A cross between two unstable *gigas* strains gave seven single ascospore cultures of mating type *A* (two highly fertile and presumed to be haploid and five sterile and presumably diploid) and four of mating type *a* (two probably diploid and two haploid). There were also seven neutral cultures which did not react with either mating type.

Bond (T. E. T.). **Notes on Taphrina.**—*Trans. Brit. mycol. Soc.*, 39, 1, pp. 60–66, 4 figs., 1956.

Descriptions are given of three species of *Taphrina* occurring in Britain, *T. tosquinetii* on alder [15, p. 693], *T. ulmi* on elm, and *T. cerasi* (syn. *T. minor*) on cherry and *Prunus subhirtella* [map 199].

Hawker (Lilian E). **Experimental control of form and phase in fungi.**—*Trans. Brit. mycol. Soc.*, 39, 1, pp. 1–12, 1956.

In her Presidential Address to the British Mycological Society [in December, 1955] the author outlined the achievements of the past 50 years in the interpretation of the effect of environment on form and phase in fungi. General conclusions were drawn regarding the nutritional conditions leading to the formation of asexual or sexual spores, and in summing up the importance was stressed of confining observations to definite stages in reproduction rather than to sporulation as a whole. It was pointed out that the nature of the mechanism involved in the changes of form and phase discussed must be sought within the cell. A list of 42 references is appended.

Nonaka (E.). **Relation between the accumulation of radioactive phosphorus-32 and that of starch at the lesions of some spotted diseases.**—*Sci. Bull. Fac. Agric. Kyushu*, 15, 4, pp. 425–430, 2 pl., 1956. [Japanese, with English summary.]

At Kyushu University, Japan, plants affected by various fungus parasites and virus diseases were placed in radioactive phosphorus-32 solution and tested by autoradiograph for phosphorus accumulation at the resulting leaf lesions [36, pp. 51, 67]. Starch accumulation was tested by the iodine-potassium iodide reaction. Greater accumulation of the phosphorus-32 in diseased than in healthy tissues resulted in 16 cases, and the contrary, or no clear difference, in 12. Correlation between phosphorus and starch accumulation was generally observed in lesions caused by fungi while none was found in those caused by tobacco and cucumber mosaic viruses and potato virus Y.

Sagromsky (H.). **Zur lichtinduzierten Ringbildung bei Pilzen III.** [On light-induced zonation in fungi III.]—*Biol. Zbl.*, 75, 7–8, pp. 385–397, 4 figs., 1 graph, 1956.

The author showed in previous experiments (*Flora*, 139, pp. 300, 360, 1952) that conidial production by two green-blue *Penicillium* spp., the hyaline mycelium of *Sclerotinia fructigena* [35, p. 897], and an orange-coloured *Verticillium* is influenced by light in the wave-length range between 365 and 530 mμ. The present series of tests at the Institute for Cultivated Plant Research, Gatersleben, Germany, was carried out with pure cultures of *Trichothecium roseum* and a white form of *Penicillium notatum* on biomalt agar.

Exposure to an alternating rhythm of 12 hours each of light and darkness results in a concentric arrangement of the conidiophores [loc. cit]. In *T. roseum*, as in many other moulds, light evokes increased conidial production, with no change in mycelial development. An increase in the nutrient content of the medium from 1 to 3 or 6 per cent. reduced the clarity of the zones. Only the short-wave spectrum influences conidial production (up to 550 mμ in the case of *T. roseum*).

The white form of *P. notatum*, which barely reacts to light, was photosensitized by the addition to the medium of 0·01 per cent. methylene blue solution. The dye also acted on *T. roseum*, extending its range of photosensitivity into the red region of the spectrum, faint zonation being discernible under the filters 661·9 and 670 mμ. The operation of methylene blue was shown not to result from temperature fluctuations in the medium or promotion of mycelial growth, but to afford a direct photodynamic stimulus to conidial development. It also seems possible that the pink pigments proper to *T. roseum* may contribute to its sensitization.

Lal (K. N.) & Subba Rao (M. S.). **Micro-element nutrition of plants.**—viii+247 pp., 14 graphs, Banaras, India, Banaras Hindu University Press, 1954. [Received October, 1956.] Rs. 20 net.

This review of the micro-element nutrition of economic plants, based on more than 1,000 contributions from the relevant literature, is intended for use by university research workers and agricultural field scientists. The principal micro-elements and their effects on crops are dealt with in relation to deficiency and toxic symptoms, external factors and micro-element response, micro-nutrition in relation to other elements, the effect of micro-elements on the inorganic and organic content of plants, growth responses of micro-elements, and physiological considerations of micro-element nutrition.

Münster (J.). **La valeur de la plantation tardive des Pommes de terre pour la production du plant. (Deuxième communication.)** [The value of late planting of Potatoes for 'seed' production. (Second communication.)]—*Rev. rom. Agric.*, 12, 7, pp. 53–55, 1956.

In trials in Switzerland from 1953 to 1955 with the potato varieties Erdgold,

Eersteling [Duke of York], Sirtema, Bintje, Bona, Jacobi, and Voran, 'seed' tubers from plantings made at intervals from May to July were compared for performance in the following growing season. The progeny from late plantings came late into harvest, but at full maturity gave yields equal or superior to that from early plantings. There are, however, two objections to the use of 'seed' from late plantings: the growers prefer early-maturing plants, and early removal of the haulms is a requirement for class A potatoes in Switzerland.

From this and from his earlier work [34, p. 241] the author concludes that in Switzerland late planting of tubers for 'seed' production with a view to reducing virus infection does not give better results than normal planting combined with early removal of the haulms.

Paul (H. L.) & Bode (O.). **Elektronen-mikroskopische Untersuchungen über Kartoffelviren. IV. Vermessungen an Teilchen des Kartoffel-A-Virus.** [Electron-microscopic studies on Potato viruses. IV. Measurements of particles of Potato virus A.]—*Phytopath. Z.*, 27, 2, pp. 211–214, 1 fig., 2 graphs, 1956.

In further studies in the current series at the Institute for Agricultural Virus Research, Brunswick, Germany [cf. 36, p. 53], the normal particle length of three strains of potato virus A, isolated from the Erdgold, Sabina, and Magna varieties, respectively, was 739 mμ, with a thickness of approximately 11 mμ.

Gehring (F.) & Bercks (R.). **Untersuchungen über das Bukett- und Pseudo-Aucuba-Virus der Kartoffel.** [Studies on the bouquet and pseudo-aucuba virus of the Potato.]—*Phytopath. Z.*, 27, 2, pp. 215–234, 11 figs., 1956.

This is an expanded account of the results of grafting experiments with potato bouquet (tobacco ring spot) and pseudo-aucuba mosaic viruses already noticed [35, pp. 481, 536]. With 20 potato varieties as stocks and diseased Earliana and Rheinlands Ruhm tomato as scions, subsequent serological tests were positive in seven cases of bouquet and two of pseudo-aucuba virus infection.

As a working hypothesis to explain the differences between the course of tobacco ring spot on tobacco and bouquet virus on potato it is postulated that in the latter host a primary acute phase is followed in the year of infection by a primary phase of recuperation with a reduction in virus concentration. In the following year a secondary acute phase develops in the progeny and is once more succeeded by a secondary phase of recovery. The secondary acute phase corresponds essentially to the well-known symptoms of bouquet disease.

Bartels (R.). **Untersuchungen über die Ausbreitung des Kartoffel-X-Virus im Feldbestand.** [Studies on the spread of Potato virus X in a field stand.]—*Phytopath. Z.*, 26, 4, pp. 443–448, 1 diag., 1956.

The spread of potato virus X in the field is effected primarily by leaf contact [17, p. 832], transmission through the root system being of minor importance [33, p. 588]. Factors determining the scope of the former mode of dissemination include varietal reaction, virulence of the virus strain, plant spacing, and soil amendments.

Experiments at the Institute for Virus Serology, Brunswick, Germany, were carried out with the Flava [35, p. 317] and Merkur varieties. The stand of the former, comprising 780 hills, was divided into two halves, (I) comprising 351 tubers of which nine (2·6 per cent.) were diseased and served as sources of infection and (II) 429 with 18 (4·2) infected. In front of and behind the Flava plots were two of healthy Merkur, each containing 130 plants, to which it was expected that infection would spread from a surrounding field of 322 Ackersegen plants with about 16 (5 per cent.) diseased as well from the Flava plots. Planting was carried out on 28th April, with a distance of 60 cm. between the rows and 33 cm. between each hill. After

emergence on 19th May, trenching, harrowing, and other cultural operations were performed with horse-drawn equipment, and towards the end of the month the stand was sprayed against *Phytophthora* [*infestans*] and Colorado beetle [*Leptinotarsa decemlineata*].

On lifting during September the number of infected plants in Flava plot (I) was found to have risen to 29 (8·2 per cent.) and in (II) to 37 (8·6); in the Ackersegen field to 45 (13·9); and in Merkur to 21 (8·1). From the distribution of infection in the experimental plots it was clear that approximately the same degree of influence on the spread of the virus was exerted by contact and field operations, the latter damaging the plants and conveying material from diseased to healthy ones. The incidence of virus X in the progeny of primarily infected plants averaged 33 per cent.

Focke (R.). **Wahrscheinlichkeitstest zur Ermittlung der Sicherheit in Augenstecklingsprüfungen.** [Probability test for the determination of certainty in eye-cutting assays.]—*Züchter*, 26, 3, pp. 65–67, 1956.

This is a theoretical discussion, based on studies at the Institute for Genetical Biology, University of Rostock, Mecklenburg, Germany, of the mathematical principles underlying the application of the probability laws to the determination of the incidence of virus (especially leaf roll) infection in seed potato samples, using the eye-cutting (tuber-indexing) method of identification [29, p. 274 *et passim*].

Betydning og udbredelse av Kartoffelviroser i Danmark. [Importance and distribution of Potato viroses in Denmark.]—*Medd. Forsøgsv. Plantek. Kbh.* 564, 4 pp., 1 fig., 1956.

The results of numerous tests have shown that potato leaf roll and Y viruses are responsible for heavy losses in Danish crops [25, pp. 135, 311; 35, p. 350, *et passim*], while recent evidence indicates that virus X may also cause significant reductions (10 to 20 per cent. being quite common), at any rate in some varieties. The distribution of the last named is extraordinarily wide. Thus, a random test made a few years ago on 62 varieties of an assortment at Tylstrup revealed total infection in 30, partial in 28, and none in four. Some varieties, e.g., Dianella, react to virus X by severe and others by faint mottling, but the majority are symptomless. Experiments with virus S [35, p. 708] on 43 varieties showed similar results, the figures being nine, 23, and 11 respectively.

In July, 1955, a survey was made of 769 fields covering 579 ha. in eight regions of the country outside the seed potato production centres to determine the incidence of leaf roll and virus Y. The average percentages were 4·4 and 1·6 respectively, compared with 0·9 for other [unspecified] viroses, the outside limits ranging from 1 to 8·9, 0·3 to 2·9, and 0·1 to 2·4, respectively.

Vaughan (E. K.) & Van Slogteren (D. H. M.). **Potato virus S in Oregon.**—*Amer. Potato J.*, 33, 7, pp. 218–219, 1956.

'Seed' pieces from various potato stocks in seven localities of Oregon, grown at the Laboratory for Flower Bulb research at Lisse, the Netherlands, were all positive to serological tests for potato virus S [35, p. 708]. The authors concluded that the virus is widespread in 'seed' potato stocks in Oregon and probably over the entire North American continent as there is unregulated traffic in potato 'seed' throughout the area.

Brakke (M. K.). **Stability of Potato yellow-dwarf virus.**—*Virology*, 2, 4, pp. 463–476, 1956.

At the Department of Botany, University of Illinois, the infectiousness of purified potato yellow dwarf virus [30, p. 535] was markedly stabilized by concentrated

sucrose, plant sap, and combinations of glycine and magnesium chloride. Low concentrations of other cations, amino acids, and proteins also had a stabilizing effect. Heat, formaldehyde, and mercuric chloride destroyed infectivity but preserved the shape of the virus particles.

Van der Zaag (D. E.). **Overwintering en epidemiologie van Phytophthora infestans, tevens enige nieuwe bestrijdingsmogelijkheden.** [Overwintering and epidemiology of *Phytophthora infestans*, together with some new possibilities of control.]—*Tijdschr. PlZiekt.*, 62, 3, pp. 89–156, 10 figs., 4 diags., 5 graphs, 1 map, 1956. [English summary.]

A general introduction to the history and economic importance of potato blight (*Phytophthora infestans*) is followed by an exhaustive, fully tabulated account of investigations in the Netherlands on the overwintering, epidemiology, and new aspects of control of the fungus, with 117 references to the relevant literature.

The initial observations were made in 1952 in a region known as 'De Streek' in North Holland, and during the two subsequent years they were extended to other parts of the country. The first outbreaks of the disease nearly always occur in 'De Streek', where potatoes (mostly of the very susceptible Eersteling [Duke of York] variety) occupy 80 per cent. of the total acreage. A summary of the first two years' work in this area has already appeared [33, p. 500].

The occurrence of 'secondarily' diseased plants depends on three factors, namely, the relation of host to pathogen in the stored tuber; the distance between the mycelium and the 'eye' at planting; and the relation of host to fungus in tuber and stem after planting. From the results of a small-scale experiment a storage temperature of 10° C. appeared to be less favourable to the development of *P. infestans* in a susceptible variety like Bintje than one of 3·5° [cf. 6, p. 47; 19, p. 491; 29, p. 50, *et passim*]. Only those tubers in which the mycelium spreads so slowly that some sprouts are still alive in the spring can give rise to secondarily diseased plants, which are most likely to appear when the distance between the mycelium and the 'eye' is 3 to 4 cm. At a shorter distance the sprout is killed before emergence and at a longer the pathogen is mostly unable to overtake the sprouts, which consequently remain healthy. The percentage of secondary infection after emergence tends to be greater in moister and warmer soils, while another important factor is varietal reaction. Thus, a combination of both susceptible foliage and tubers, as in Duke of York, resulted in the maximum of secondary infection in comparative tests. Varieties with resistant foliage, e.g., Furore, or tubers (Koopmans Blauwe) sustained slighter damage, and those with combined shoot and tuber resistance, represented by Voran and Noordeling, little or none.

On an average one primary blight focus per sq. km. (or per 100 ha. under Duke of York) was detected in 'De Streek' in 1953. Meteorological conditions at Hoorn, about 12 km. to the south-west, were conducive to the appearance of symptoms [cf. 27, p. 88] six times between mid-May and the latter part of June, the last period being followed by an epiphytotic throughout the district. In North Brabant a primary focus had spread widely on the Wilpo variety as early as 30th June, 1954, and by 21st July several Bintje fields had contracted infection. Five favourable periods had occurred before the latter date, three of them even prior to 30th June. The end of July was again propitious and by 1st August the disease was rife throughout the province.

Attacks on the stems, the leaves often remaining healthy, were a noteworthy feature of the primary foci in 'De Streek', leaf axils holding moisture and forming better infection courts than the leaves. This was demonstrated by inoculations with droplets of zoospore suspensions and subsequent maintenance at a relative humidity of 95 to 100 per cent. for periods up to four hours, at the end of which the percentages of leaf and axil infection were 60 and 91, respectively. The importance

of the stems to infection lies in their relative longevity as compared with the leaves in dry, warm weather.

In tests to determine the significance of varietal susceptibility in relation to the epidemiology of blight, Duke of York, Eigenheimer, and Noordeling were inoculated at four places in the field and the spread of the fungus gauged after 12 days by counting the numbers of newly infected leaves, which amounted to 180, 30, and one, respectively. Since the differences in susceptibility calculated by this method appeared to exceed those allotted in the 'Descriptive List of Varieties of Field Crops', (3, 5, and 7·5, respectively, in an ascending scale from 1 to 10), the reactions were studied in the greenhouse. The course of the disease comprises three phases, viz., penetration, extension, and sporulation, and susceptibility should therefore be evaluated by three criteria, i.e., the chance of spore penetration; the rate of mycelial spread in the plant tissue; and the rate and quantity of sporangial production per surface unit. Determinations were made as follows, using ten equal-sized leaves per treatment. The number of foliar lesions was counted [cf. 27, p. 89] three days after inoculation with uniform amounts of a very dilute zoospore suspension. Six days after apical inoculation with a droplet of a zoospore suspension at a temperature of 20° and high relative humidity the spread of the discoloured area towards the base was measured. Five days after inoculation with a concentrated zoospore suspension under the foregoing conditions, and again two days later, the sporangia were counted by rinsing the leaves in water, the two totals being added together. It was thus established that the intermediate degree of resistance of Eigenheimer (compared with Duke of York, used as a standard) is due primarily to the low risk of spore penetration, while the high resistance of Voran and Noordeling is attributable not only to this factor but to meagre sporulation as well [cf. 35, p. 629].

The rate of spread of the pathogen is used to assess varietal reaction in the field, where by this criterion the susceptibility of Eigenheimer and Noordeling (again in comparison with Duke of York) was lower than in the greenhouse, for which two reasons are adduced. First, there were probably some diseased leaves of the second generation on the Duke of York plants, resulting in an unduly high count; and secondly, the greenhouse was ideal for the fungus. The mean numbers of infected leaves of Duke of York, Eigenheimer, and Noordeling in the field were 180, 30, and one, respectively (1,000, 240, and 15, in the greenhouse). Theoretically, after three generations the respective ratios would be $(180)^3$, $(30)^3$, and $(1)^3$, whence it appears that only a focus in a susceptible variety is of epidemiological importance.

In a region of intensive potato cultivation few sporangia are lost through alighting in the absence of a host. In the case of small foci, e.g., on refuse-heaps, and long distances between potato fields no epiphytotic may develop [cf. 32, p. 97]. In order to ascertain the distance covered by the sporangia of *P. infestans* [cf. 27, p. 49], healthy Duke of York, Eigenheimer and Libertas tubers were planted in 1954 in a field free from 'volunteers' on the island of Rottumeroog in the Waddenzee, 11 km. north of the coast. No blight symptoms were detected on 25th July, and not until 17th August, when most of the stands at Gröningen were infected, did the disease appear on the island, showing that the sporangia can be carried by the wind over a distance of at least 11 km. without loss of viability.

The influence of the microclimate [cf. 25, p. 470; 33, p. 499] was studied by measuring the atmospheric humidity in the crop and at a height of 1·7 m. above soil-level over the period from 1st to 7th August, 1955, with a ventilated psychrometer. At 2 p.m. the relative air humidity in the crop was 17 per cent. greater on an average than above it. However, observations made a year later on an Eigenheimer crop on stiff clay soil during a dry, sunny, windy spell from the 9th to the 26th revealed little difference between the relative humidity in the crop

and that shown by a hyograph at 2·2 m. above soil-level. It is concluded that the extent of the difference between the atmospheric humidity within and above the crop depends on (1) macroclimatic conditions [35, p. 871], especially wind, (2) the development of the crop, and (3) the moisture content of the soil.

The problem of control is considered under the headings of phytosanitary measures, comprising the planting of healthy tubers; the collection and destruction of diseased tubers; and field inspections, beginning at the end of May, for the detection of primary foci and their elimination by haulm-killing or roguing [see below, p. 122] and covering with soil.

Experiments in 1954 on the disinfection of Duke of York and Bintje seed tubers by one hour's immersion in water heated to 43° or half-an-hour at 45° resulted in the destruction of the pathogen, but the treatment tended to reduce yields.

As indicated above, it is only from very susceptible and susceptible varieties that new foci of infection arise, and breeding to secure a measure of resistance in both foliage and tubers such as occurs, for instance, in Voran and Noordeling is recommended as a more hopeful approach than attempts to achieve immunity, which is regarded in some quarters as impracticable.

Smith (L. P.). **Potato blight forecasting by 90 per cent. humidity criteria.**—*Plant Path.*, 5, 3, pp. 83–87, 2 graphs, 1956.

Analysis of the performance of the English and Welsh stations for forecasting attacks of potato blight [*Phytophthora infestans*: 36, p. 54] for the years 1950 to 1954 showed that 43 out of a total of 220 forecasts from individual stations were not valid for their respective zones, the breakdowns being due, apparently, to failure of the humidity criterion. The data suggested that reasonably good criteria would be provided by two consecutive days each with a minimum temperature of 50° F. or over, and at least 11 hours' duration of 90 per cent. or more humidity. Forecasting by flushes of 90 per cent. humidity would have been quite satisfactory, but the difference in effectiveness between this method and the Beaumont system would appear to be small in practice. Real advantage would result if the number of hours of 90 per cent. humidity or more recorded each day at all the stations were made available to the investigators, but this is not practicable.

Romanovich (E. A.). Влияние межвидовой вегетативной гибридизации на ракоустойчивость Картофеля. [The effect of intervarietal vegetative hybridization on wart resistance of Potato.]—Агробиолия [*Agrobiology, Moscow*], 98, 2, pp. 52–57, 1956.

In preliminary laboratory and field trials, from 1951 to 1953, inclusive, at the Pan-Soviet Scientific Research Station for Potato Wart, [? Moscow], U.S.S.R., following the grafting of *Solanum schickii* and *S. laplaticum*, both resistant to wart (*Synchytrium endobioticum*) [34, p. 477], on to the susceptible potato variety Rozovuy iz Milet, the first and second tuber generations were both resistant.

Klindić (Olga) & Buturović (D.). **Uvelost ('venuće') Krompira u Butmiru.** [Potato wilt at Butmir.]—*Zasht. Bilja* (*Plant Prot., Beograd*), *1956*, 33, pp. 67–73, 4 pl., 1956. [German summary.]

Potato wilt, of unknown origin and regularly accompanied by *Colletotrichum atramentarium* [34, pp. 135, 705], is stated to have become serious in recent years in many potato-growing areas of Bosnia, Yugoslavia, often resulting in 50 to 90 per cent. wilted or prematurely dead plants. In experimental plots at the Institute for Agricultural Research at Butmir the disease has caused serious damage, reducing yields by 30·5 to 90 per cent., according to climatic conditions in various years and the potato varieties used.

The disease is characterized by the yellowing and curling upwards of the leaves, which then wilt and become necrotic. Numerous shoots develop on the lower part of the stem, in the leaf nodes, and remain green for longer periods than the foliage. Similarly, the stem, becoming angular, cracked, and brittle, keeps its green or greenish-yellow colour longer. The symptoms, particularly in the early stages, closely resemble those caused by *Rhizoctonia* [*Corticium*] *solani*. Dry rot of the underground part of the plant, notably of the root system, is very characteristic of potato wilt, which reaches its maximum in July and August.

The behaviour of *C. atramentarium* is briefly described with reference to the literature (11 titles).

New or uncommon plant diseases and pests.—*Plant Path.*, 5, 3, p. 114, 2 figs. (facing p. 95), 1956.

E. Lester reports that in 1947 Home Guard potatoes received from Lincolnshire were found to be affected by stem-end hard rot (*Phomopsis tuberivora*) [12, p. 241; 29, p. 113], not before recorded in Great Britain. More affected tubers were received in 1949, and in 1955 the disease occurred sporadically in a number of samples, mainly of King Edward. Attempts to inoculate healthy tubers with the fungus in 1947–8 and again in 1949 gave negative results. The evidence suggests that *P. tuberivora* may be only a secondary organism which invaded the depleted heel-end of the tubers in consequence of the hot, dry weather of the three seasons when the disease occurred.

Stapp (C.) & Hartwich (W.). **Zur Frage der Resistenzverschiedenheiten pflanzlicher Wirte gegenüber pathogenen Bakterien und ihre Ursachen. II. Mitt.: Weitere Untersuchungen mit Erwinia phytophthora.** [On the question of the differences in resistance of plant hosts to pathogenic bacteria and their causes. Note II: further studies on *Erwinia phytophthora*.]—*Zbl. Bakt.*, Abt. 2, 109, 23–25, pp. 611–627, 5 graphs, 1956.

Of 49 additional Solanaceae tested for their reactions to *Erwinia phytophthora* [34, p. 479] under constant environmental conditions (temperature of 26° C., all-day illumination, and a saturated atmosphere), 14 proved to be highly susceptible, nine susceptible, seven moderately susceptible or moderately resistant, 12 resistant, and seven highly resistant. Representatives of the first group included *Nicotiana glauca*, *N. micrantha*, *N. paniculata*, *N. suaveolens*, *Salpiglossis variabilis*, *Solanum demissum*, *S. polyadenium*, and *S. rybinii*; *S. boergeri* was among the highly resistant, while *N. atropurpurea*, *N. sanderae*, Friedrichsthaler and Havanna IIc tobacco, *Physalis franchetii*, *S. dulcamara*, and *S. commersoni* were resistant.

Traumatic metacutinization begins in the phloem and extends through the parenchymatous tissue. *E. phytophthora* expedited this process in various *S.* spp., Haubners Vollendung tomato, *Cyphomandra betacea*, and *N. paniculata* but retarded it in other *N.* spp. Rapidity of wound-periderm formation does not necessarily exclude a high degree of susceptibility, as for instance in *S. polyadenium* and *N. paniculata*, and cannot be regarded, therefore, as the most important defence reaction. It is postulated that the structure of the middle lamella is largely responsible for susceptibility or resistance to *E. phytophthora* [cf. 13, p. 392], irrespective of any defence reactions which may develop after infection.

Kovács (A.) & Szeöke (E.). **Die phytopathologische Bedeutung der kutikulären Exkretion.** [The phytopathological importance of cuticular excretion.]—*Phytopath. Z.*, 27, 3, pp. 335–349, 4 graphs, 1956.

At the Institute for Plant Breeding, Sopronhorpács, Hungary, the authors investigated the action and nature of the excretions (by exosmosis) from wheat, red

clover, poplar, lilac, chilli, tomato, and sugar beet leaves on the germination of *Botrytis cinerea* [cf. 1, p. 238], *Ascochyta pisi*, and *Puccinia triticina* spores.

B. cinerea was the most sensitive species and *P. triticina* the least so. All the excretions exerted either an inhibitory or stimulatory influence, varying with the concentration and the susceptibility of the fungus. Their effects are attributed to the operation of specific, highly active substances, distinct from the inorganic and readily oxidizable components, which were shown to be unconcerned in the regulation of spore germination. The active ingredients dissolve comparatively slowly from the leaves, and it is thought that they may be present under normal conditions in dew or rain drops in sufficient strength to inhibit conidial germination in *B. cinerea*.

Keller (E. R.) & Weiss (R.). **Über Erfahrungen beim Totspritzen von Kartoffelfeldern.** [On experiences in the lethal spraying of Potato fields.]—*Mitt. schweiz. Landw.*, 4, 6, pp. 97–104, 3 figs., 1956.

From the results of further comparative tests, conducted under the supervision of the Agricultural Experiment Station, Zürich-Oerlikon, Switzerland, to determine the relative efficiency of chemical sprays and haulm-pulling for the control of [unspecified] potato viruses [33, p. 171; 35, p. 90, *et passim*], it is concluded that the latter method is still the more reliable of the two.

In 1953–4 two tar-oil fractions, 54 and 59, used at the rate of 250 l. per ha., acted speedily and thoroughly but left an unpleasant odour in the field, while 59 further imparted a disagreeable flavour to the harvested Bintje potatoes. The action of both 1·5 per cent. monoxyl Pechiney-Progil (sodium monochloroacetate+sodium pentachlorophenol) at 1,000 l. per ha., and 13 per cent. tufan D (DNC) [cf. 35, p. 920] at 2,000 l. was too slow and incomplete, permitting the resumption of growth after a fortnight.

Emphasizing the importance of thoroughness in chemical haulm-killing, the authors recommended two sprayings, each to be immediately preceded or accompanied by severe wounding to facilitate penetration. Some hours should elapse between the two treatments (the second being carried out in the opposite direction to the first) to allow the chemical to dry. The rules governing field inspection require complete desiccation of class A plants by a certain day, the so-called early harvest date. All the above-mentioned preparations take five days to produce this effect.

In 1955 chemical haulm-killing was also tested for the control of tuber rot caused by *Phytophthora infestans*, using the DNC compounds tufan D, EK 54 [34, p. 102], and deramo (Siegfried AG., Zofingen) at 1·5 per cent. and 1,500 l. per ha. The incidence of infection was reduced from 5·9 to 2·3 per cent. The fields should not be sprayed until the fungus is spreading rapidly and at least a quarter of the leaves are attacked. Preliminary wounding of the plants is not absolutely necessary in the case of blight. Harvesting should be deferred for two to three weeks after the treatment.

Fungicides for germination of Rice.—*Agric. Gaz. N.S.W.*, 67, 7, p. 357, 1956.

Although New South Wales is free from serious diseases of rice [35, p. 356], there is a high death-rate among seedlings, which might be caused by a soil-inhabiting parasite. Studies at the Yanco Experiment Farm over a five-year period indicated that seedling development was influenced more by seasonal conditions than by seed treatment, but of the four fungicidal dusts tested, thiram was the most promising.

MILLER (P. R.). **Plant disease situation in the United States.**—*F.A.O. Pl. Prot. Bull.*, 4, 10, pp. 152–156, 1956.

In the summer of 1955, dry-land and lightly irrigated sorghum growing in eastern New Mexico was affected by anthracnose stalk rot, caused chiefly by *Colletotrichum graminicola* [cf. 36, p. 9 *et passim*] and partly by *Gloeosporium* spp. Though this was the first identification of the disease here, it has probably been present in New Mexico for some years.

In 1955, also, rice blast (*Piricularia oryzae*) [map 51] reappeared in the Gulf Coast rice area, the outbreak being severe on the Magnolia and Zenit varieties in Acadia Parish, Louisiana. The disease apparently became established in July in wet weather, but after a drier August was arrested, and new growth mostly remained healthy.

WAKIMOTO (S.). **Studies on the multiplication of OP_1 phage (Xanthomonas oryzae bacteriophage). I. One-step growth experiment under various conditions.**—*Sci. Bull. Fac. Agric. Kyushu*, 15, 2, pp. 151–160, 2 graphs, 1955. [Japanese, with English summary.]

In further studies at Kyushu University, Japan, of the bacteriophage (OP_1 phage) of *Xanthomonas oryzae* [35, p. 160 and next abstract] the writer discovered that when added to *X. oryzae* at 30° C. in vitamin-free casein hydrolysate medium it multiplied with the average burst size of 7 within 20 min. The addition of 0·0045 M calcium chloride increased the burst size to 12. In sap from rice leaves the phage was gradually inactivated.

Optimum growth of the phage occurred around 30°. The latent period was prolonged to about 80 minutes at 20°, but keeping the host-phage complex at 30° for 10 minutes after infection and then at 20° resulted in the normal latent period of 40 minutes. Initial incubation at 30° and subsequent exposure to 10° resulted in dormancy, but phage multiplication was renewed on replacement at 30°. At 40° the complex was rapidly inactivated.

WAKIMOTO (S.) & YOSHII (H.). **Quantitative determination of the population of a bacteria by the phage technique.**—*Sci. Bull. Fac. Agric. Kyushu*, 15, 2, pp. 161–169, 1955. [Japanese, with English summary.]

Using the OP_1 phage of *Xanthomonas oryzae* [see preceding abstract] the authors devised a method of determining the number of living cells of certain bacteria in soil and other media. The latent period, rise period, and burst size of the phage-bacterium complex need to be known. The number of living cells of the bacterium (N) is given by the formula

$$N = \frac{\text{Total number of phage particles produced}}{\text{average burst size}}.$$

If the bacteria are too infrequent to give a result, a second infection with the phage is needed, and the bacterial suspension is added to the centrifuged supernatant fluid of the phage in the stationary period, the formula then being

$$N = \frac{\text{Total number of phage particles produced}}{(\text{average burst size})^2}.$$

The results showed that *X. oryzae* could survive in dry soil for a certain period and multiplied less rapidly in the leaves of resistant rice varieties than of susceptible ones.

CONSTABLE (D. H.). **Foliar zinc and Oidium heveae in Ceylon.**—*Nature, Lond.*, 178, 45, 39, pp. 926–927, 1956.

Following the observation made at the Rubber Research Institute, Malaya, that

zinc deficiency was a predisposing factor to infection of *Hevea* rubber by *Oidium heveae* [35, p. 547] an analysis was made of the zinc contents of mature rubber leaves of resistant and susceptible varieties at the Rubber Research Institute, Ceylon. No significant differences in the zinc contents of the highly resistant LCB 870, the medium resistant PB 86, or the susceptible Tjir 1 were observed.

Hutchison (F. W.). **Testing of coal tar fungicides for the control of mouldy rot (Ceratostomella fimbriata).**

Coles (G. V.) & Byrde (R. J. W.). **The fungicidal properties of coal tar distillates. I. Investigations of the fungicidal efficiencies of components of coal tar distillates.**

Coles (G. V.), Martin (J. T.), & Byrde (R. J. W.). **The fungicidal properties of coal tar distillates. II. Development of a method for coal tar fungicide analysis and a comparison between the chemical analysis of proprietary materials and their biological performance in the field.**

Coles (G. V.). **The analysis of coal tar fungicides.**—*J. Rubb. Res. Inst. Malaya*, 14, *Commun.* 299, pp. 451–458; 459–471; 472–481; 482–491; 1 fig., 1 diag., 13 graphs, 1956.

In the first paper, the methods of testing coal tar fungicides for the control of *Ceratostomella* [*Ceratocystis*] *fimbriata* at present employed by the Rubber Research Institute of Malaya, and consisting of an *in vitro* fungicidal test, a phytocidal test, and a field test are described [33, p. 258]. The results presented in the second and third papers, describing research on the coal tar distillates at the University of Bristol Research Station, Long Ashton, have already been noticed [34, p. 611; 35, p. 925]. The last paper outlines the technique evolved at Long Ashton for separating by analysis the constituents of coal-tar fungicides used against diseases of rubber.

Røyset (S.). **Magnesiumskort og magnesiumsforsøk.** [Magnesium deficiency and magnesium experiments.]—*Norsk Landbr.*, *1956*, 21, pp. 464–466, 1956.

Magnesium deficiency is stated to be widespread in western Norway, occurring in all types of soil and expressed by a marked variety of symptoms, e.g., in crucifers, Gramineae, and potatoes. By mid-July, 1956, the foliage of pear trees in mixed clay and sandy soils showed a brownish discoloration due to extreme magnesium shortage. Increased yields of oats were secured from 1951 to 1954 (especially in the wet season of 1952) by the addition of potash magnesia to the basic fertilizer of lime-ammonium nitrate and superphosphate, but the exact proportions required are not yet altogether clear.

Nour (M. A.). **A preliminary survey of fungi in some Sudan soils.**—*Trans. Brit. mycol. Soc.*, 39, 3, pp. 357–360, 1956.

Thirty-five species of fungi isolated during a preliminary survey of Sudan soils using the Waksman dilution method [2, p. 233], Warcup's soil plate method [29, p. 530], and Chesters' immersion tube technique [28, p. 240] are listed. There was little qualitative difference in the isolations from different soils.

Nicholls (Valerie O.). **Fungi of chalk soils.**—*Trans. Brit. mycol. Soc.*, 39, 2, pp. 233–238, 1956.

The predominating species in eight different chalk soils examined by the dilution plate method were *Penicillium nigricans*, *Mortierella alpina*, and *M. minutissima* [cf. 31, p. 142; 33, p. 501]. No oomycetes or ascomycetes were isolated, and only

one basidiomycete. It is suggested that certain species occur generally throughout chalk soils while a number that are less common have more exacting requirements and are confined to single types of such soil.

CHESTERS (C. G. C.) & THORNTON (R. H.). **A comparison of techniques for isolating soil fungi.**—*Trans. Brit. mycol. Soc.*, 39, 3, pp. 301–313, 1956.

In parallel studies at the Department of Botany, University of Nottingham, results obtained in isolating fungi from the soil using the screened immersion plate technique [35, p. 395] were compared with those from five other isolation methods in general use. In a comparison with the immersion tube method [see above, p. 124] the A horizon of a brown forest soil was sampled, and similar numbers of fungi were isolated. *Mortierella humilis* and *Mucor hiemalis* predominated in the immersion tubes but were less numerous in the screened immersion plates. In the latter the most frequent isolates were *M. humilis* and *M. vinacea*. Out of 21 species isolated 18 were obtained by the immersion plates and ten by the tubes. The larger diameter (0·5 cm.) of apertures in the screened immersion plates resulted in less competition for entry than exists in the tubes. Comparing the screened immersion plates with direct inoculation of soil particles on agar 14 species of fungi were isolated from forest soil by the former method as opposed to six by the latter.

Two types of soil were tested in a comparison of the screened immersion plate and the modified Rossi-Cholodny buried slide techniques [14, p. 469], a brown forest soil (three horizons) and a podsol (four horizons). In general, the fungi isolated from the slides were those species more commonly isolated by screened immersion plates.

In a similar comparison with the dilution plate method [see above, p. 124], fungi isolated by this technique were those which sporulated in the soil, while mycelium, more resistant to fragmentation, was recorded less frequently. Certain species growing on enriched nutrient media used in the dilution plates may produce substances inhibiting or promoting the growth of other fungi, and the medium itself may be selective compared with the plain water agar used in the screened immersion plates. The dilution plate method has the further disadvantage that the natural soil structure is destroyed and the distribution of colonies on the plates bears no relation to the original spacing in soil.

In the fifth comparison, using Warcup's soil plate method [loc. cit.] two depths of the A horizon in the brown forest soil were sampled. Of a total of 49 isolated species 12 were common to the soil plate and screened immersion plate methods, 15 additional species being obtained by the former technique and a further 21 by the latter. Greater numbers of *Penicillium* were present on the soil plates than on the screened ones.

It is concluded that the screened immersion plate technique results in a wider range and variety of species isolated than by any other method. The technique also provided a quantitative measure of the relative distribution of fungi in the soil.

PARK (D.). **Effect of substrate on a microbial antagonism, with reference to soil conditions.**—*Trans. Brit. mycol. Soc.*, 39, 2, pp. 239–259, 1 pl., 2 figs., 1 graph, 1956.

In further studies at the Department of Cryptogamic Botany, University of Manchester [cf. 35, p. 40], the antagonism to *Fusarium roseum* of *Bacillus macerans* isolated from soil partially sterilized by propylene oxide was investigated. On agar and in liquid culture the two organisms exhibited a mutual inhibition but eventually the fungus became dominant. In sand and autoclaved soil cultures the reverse occurred, *F. roseum* being subordinate and only remaining viable by the production of resting spores, the mycelium having been lysed after an interval

apparently necessary for the bacterium to become adapted to the presence of the fungus.

The author considers that the lysis of one organism by another may be caused by an increase in the intensity of staling and thus of autolysis by the sensitive competitor, and that heterolysis and autolysis are not necessarily mutually exclusive processes. The increased toxicity of the bacterium in sand and soil cultures may be due to one or both of two factors. Staling is more marked under conditions of reduced aeration such as would exist in the liquid film between soil or sand particles. The increased toxicity may also be a steriotactic phenomenon due to better growth of bacteria on solid surfaces. The addition of powdered agar to sand cultures may, however, have kept the mycelium alive by providing a physically favourable habitat, which function may also be performed in soil by partly decomposed plant debris.

Talboys (P. W.). **Mechanism of Verticillium wilt tolerance in the Hop.**—Abs. in *Trans. Brit. mycol. Soc.*, 39, 3, p. 381, 1956.

Much of the information in this paper on the mechanism for tolerance of wilt (*Verticillium* [*albo-atrum*]) in hops, presented to a meeting of the Society on 14th October, 1955, has already been noticed [35, pp. 875, 927]. Two phases are postulated in the development of wilt disease; in the first or determinative phase the conditions leading to symptom expression are established and in the second or expressive phase the conditions of vascular invasion develop.

Acute wilt in a sensitive variety is accompanied by cell-wall lignification and lignituber development in the epidermis and cortex of the root, extensive invasion by the fungus, and little tylosis, symptoms being probably toxin-induced. In a tolerant variety various defensive reactions, including extensive tylosis, are encountered [loc. cit.], and leaf symptoms in this case may result from tylosis of the leaf trace vessels rather than toxic action. It is suggested that the end of the determinative stage is reached when conditions of infection decide whether or not such tylosis will occur.

Steigerwald (E.). **Zur Problematik des Abbaues bei Pfefferminze.** [On the problems of Peppermint degeneration.]—*Pflanzenschutz*, 8, 7, pp. 99–101, 1956.

This is a discussion of the complex of overlapping factors responsible for Mitcham peppermint degeneration in Bavaria, where 93·8 per cent. of the total acreage under the crop in Federal Germany is cultivated. The principal cause of the trouble is the continuous use for many years of the same root material on the same site. However, a large-scale interchange of cuttings between regions differing widely in climatic and soil conditions did not result in a uniform increase in yields, a fact attributed to the great diversity in the performance of material of varying provenance. No correlation could be established between yield and oil content, the latter being a well-marked hereditary character and very dependent on sunlight. During 1956 only the 15 best German stocks are being used for propagation at the State Horticultural Institute in comparison with English and French ones of the same variety. Attempts are in progress to develop by clone formation a stock or type with the requisite standard of leaf production, oil content, and resistance to diseases, especially rust [*Puccinia menthae*: 35, p. 395].

Adsuar (J.). **Evidence of the presence of Sugarcane-mosaic virus in the roots of infected Sugarcane plants.**—*J. Agric. Univ. P.R.*, 40, 2, p. 125, 1956.

The presence of sugar-cane mosaic virus in the roots of diseased cane was confirmed at the University of Puerto Rico [cf. 34, p. 399] when an extract of the macerated roots was used for inoculating 100 sorghum seedlings, six of which became infected.

Veiga (F. M.). **Ratoon stunting disease in Brazil.**—*Cane Gr. quart. Bull.*, 20, 1, pp. 3–6, 6 figs., 1956.

Sugar-cane ratoon stunting virus disease [map 318] was first noticed in Brazil on the variety H. 32–8560 imported for breeding purposes at the Campos Experiment Station. The results of the inoculation of a number of varieties have already been noticed [36, p. 63].

Albuquerque (M. J.) & Arakeri (H. R.). **Sugarcane red stripe disease on Co. 419.**]—*Indian Sug.*, 6, 5, pp. 323–324, 1956.

Red stripe disease (*Xanthomonas rubrilineans*) has been observed for the first time in Bombay [map 39] on Co. 419 sugar-cane. It has also been reported from U[ttar] P[radesh: 28, p. 55] and Bihar. Inoculation tests on 25 promising varieties at the Sugarcane Research Station, Padegaon, revealed susceptibility to the pathogen in Co. 458, 678, 718, 745 (used as a windbreak), 775, 787, 792, 799, 800, and 911.

A watch should be kept for outbreaks of red stripe in light or alluvial soils. As soon as the symptoms appear the affected leaves should be destroyed. Unduly close planting and excessive use of soil amendments are inadvisable.

Srinivasan (K. V.). **Pythium catenulatum Matthews causing Sugarcane seedling root rot.**—*Curr. Sci.*, 25, 9, pp. 299–300, 1 fig., 1956.

Pythium catenulatum [cf. 28, p. 83] was isolated at the Sugarcane Breeding Institute, Coimbatore, India, from sugar-cane seedlings killed by root rot, which was reproduced by inoculation of seedlings up to three months old with the organism. The author believes this to be the first record of *P. catenulatum* parasitizing any of the higher plants.

Steindl (D. R. L.). **Downy mildew disease found at Bundaberg.**—*Cane Gr. quart. Bull.*, 20, 1, p. 7, 1 fig., 1956.

The recurrence of sugar-cane downy mildew [*Sclerospora sacchari*: cf. 34, p. 183] is reported from the Bundaberg district, Queensland, on the varieties Vesta and P.O.J. 2878 and on odd stools of Q. 50 and an experimental variety. A total of 130 diseased stools have been destroyed. This outbreak again emphasizes the importance of keeping a constant watch for both old and new diseases and being familiar with the disease reaction of all commercial varieties.

Ragab (M. A.). **A contribution to the fungi of Egypt.**—*Mycologia*, 48, 1, pp. 167–168, 1956.

Sixteen new records of Egyptian fungi are listed, including *Sordaria fimicola* from beet seeds, *Gibberella fujikuroi* from onion roots, *Trichothecium roseum* on tomato fruits, *Melanospora zamiae* on pods of broad bean, and *Fusarium equiseti* from tomato fruits.

Hansford (C. G.). **Australian fungi. III. New species and revisions (continued).**—*Proc. Linn. Soc. N.S.W.*, 81, 1, pp. 23–51, 1956.

In this further contribution [cf. 35, p. 127] the author describes 88 species of Australian fungi, of which 27 are new, and one new genus, *Brooksia*, with a single species.

Dingley (Joan M.). **The Hypocreales of New Zealand—VII. A revision of records and species in the Hypocreaceae.**—*Trans. roy. Soc. N.Z.*, 83, 4, pp. 643–662, 1956.

In a continuation of this series the author corrects many of the names of species

in the Hypocreaceae used in previous papers [cf. 33, p. 184] of which some were misdeterminations and others subsequently found to be synonyms of earlier described species. Six new species are described and Australian records discussed where they have reference to New Zealand species.

Lucas (Maria Teresa). **Fungi Lusitaniae XIV.** [Fungi of Portugal XIV.]—*Agron. lusit.*, 18, 2, pp. 109–122, 5 figs., 1956.

Two new species are included in this further instalment of the current series [cf. 35, p. 235], while a number are new for Portugal. Mention may be made of *Puccinia chrysanthemi* on chrysanthemum [map 117]; *Zignoella nematasia* on oleander; *Lophiostoma desmazierii* on *Arbutus unedo* and *Myrica fayae*; *Cytospora fertilis* on *Salix babylonica*; *C. leucosperma* on oak (*Quercus coccifera*); *C. melasperma* var. *fraxini* (the last three species are new records for Portugal) and *Phomopsis controversa* on ash (*Fraxinus angustifolia*); *Phoma exigua* and *Acrostalagmus cinnabarinus* [*Nectria inventa*] on flax; *C. nobilis* and *Microdiplodia harknessi* on *Laurus nobilis* (the latter a new record for the country); *Dothiorella vulgaris* on *Nicotiana glauca*; *Botryodiplodia acinosa* on lime (*Tilia platyphylla*); and *Diplodia moricola* on mulberry (both new to Portugal).

Rogodin (M. N.). Новые виды грибов из Башкирской АССР. [New species of fungi from Bashkir A.S.S.R.]—Бот. Матер. (*Not. syst. Sect. crypt. Inst. bot. Acad. Sci. U.S.S.R.*), 11, pp. 164–166, 1956.

Seven new species are described from Bashkir, U.S.S.R. *Phyllosticta fagopyri*, producing on the foliage of buckwheat more or less round, light brown spots, has spore measurements of 6 to 8 by 3 to 4 μ; the spores of *Ascochyta sinapis* and *Septoria sinapis-albae* on leaves of white mustard (*Sinapis alba*) measure, respectively, 12 to 16 by 3 to 4 and 15 to 18 by 1 to 1·5 μ, the former producing irregular, greyish or pale yellow leaf spots and the latter pale brown, round or irregular ones; *Septoria cucumis*, developing large, white, diffuse, convex spots on the foliage of cucumber, has spores measuring 30 to 50 by 5 to 7 μ. Among the other new species listed are *S. scabra* on elm leaves and *Gloeosporium corylinum* on leaves of *Corylus avellana*.

Purdy (L. H.). **Factors affecting apothecial production by Sclerotinia sclerotiorum.**—*Phytopathology*, 46, 7, pp. 409–410, 1 fig., 1956.

At the University of California, Davis, two isolates of *Sclerotinia sclerotiorum*, representatives of a large and a small sclerotium type, respectively [35, p. 45], were cultured on potato dextrose agar at temperatures ranging from 4° to 27° C. After sclerotia were produced they were left on the agar surface at the several temperatures for 30, 60, or 90 days before transference to sub-optimum conditions for apothecial formation. Sclerotia of the large type produced and aged at 15° or 18° for 60 or 90 days gave rise to apothecial rudiments within a week of being placed in water at 15°. In general, the process was accomplished more rapidly by large-type sclerotia produced within the range from 12° to 24° than at 4° or 27°. The minimum period required for the inception of apothecial formation by sclerotia of the small type was 23 days after 60 days ageing at 4°.

Attention has been drawn to the advantages of natural over artificial media for the culture and fructification of certain fungi [26, p. 554]. Small sclerotia produced on autoclaved celery or potato dextrose agar at 4°, 12°, 18°, and 24° were compared for their capacity to form apothecia in distilled water at 15°. The sclerotia produced on celery at 4° and 12° began to form apothecial elements 10 to 15 days sooner than those originating at 18° or 24°, at which temperatures very few were produced. Also very few were produced by sclerotia formed on potato dextrose agar at any of the temperatures tested.

Light was found to be essential for the normal development and expansion of apothecial disks [cf. 22, p. 98], but not for the inception of fruit body production. Most of the isolates occasionally gave rise to abnormal apothecia, but the deviations did not persist in monoascospore cultures, indicating that they were not of genetic origin.

Doguet (G.). **Le genre 'Melanospora': biologie, morphologie, développement, systématique.** [The genus '*Melanospora*': biology, morphology, development, systematy.]—313 pp., 24 pl., 4 figs., Bordeaux, Imprimerie E. Drouillard, 1955. (ex *Le Botaniste*, Sér. 39, 1–6, pp. 1–313, 1955.)

In this work the author presents a revision of the genus *Melanospora* in which he describes in detail the cultural and morphological characters of each species and their variation, with their biological and cytological features, special attention being devoted to the origin and development of the several parts of the perithecium. The work opens with a brief historical review of the subject and a short account of the materials and methods used. Sections follow dealing with species having smooth, lemon-shaped spores, subdivided according to whether the perithecial neck is equal in length to the diameter of the spore, shorter, absent, or very long, and those with reticulated, cylindrical, and ovoid to cubical spores, respectively; eight species are placed in the miscellaneous section and 21 are considered doubtful or unacceptable. There is one new species and a number of new combinations are made. An index to the species cited is provided, and there is a bibliography of 169 titles.

Terrier (C.). **À propos de Lophodermium pinicola Tehon.** Concerning *Lophodermium pinicola* Tehon.]—*Phytopath. Z.*, 27, 1, pp. 113–115, 1956. [German summary.]

Petrak's recent proposal to discard *Lophodermium pinastri* (Schrad. ex Fr.) Chev. for the pine needle-cast fungus in favour of *L. pinicola* Tehon [35, p. 855] is criticized on the grounds that Tehon was not justified in altering Chevallier's designation. In 1826 Chevallier transferred *Hysterium pinastri* Schrader to *Lophodermium* on the basis of Mougeot & Nestler's exsiccatum of 1810 (Stirpes cryptogamae vogeso-rhenanae, fasc. 1), and not on that of Roumeguère's material, the description of which was not published until 1882. Since the fungus, both in Mouget & Nestler's exsiccatum and in that of Fries (Scleromyceti sueciae, No. 30, 1819, not 50, which is a misprint in *Syst. mycol.*, 2, p. 587, 1822–3), occurs on *Pinus sylvestris* needles, Chevallier's name gives rise to no confusion and remains perfectly valid. *L. pinicola* Tehon should consequently be reduced to the rank of a synonym of *L. pinastri*.

Flentje (N. T.). **Studies on Pellicularia filamentosa (Pat.) Rogers. I. Formation of the perfect stage.**—*Trans. Brit. mycol. Soc.*, 39, 3, pp. 343–356, 1 pl., 3 figs., 1956.

At the Waite Agricultural Research Institute, University of Adelaide, 28 isolates of *Rhizoctonia* [*Corticium*] *solani* from England and Australia, which when tested on seven host families showed seven pathogenic strains, formed the perfect state on one or more of three substrates, soil, agar, or the base of plant stems (e.g. wheat, potato, tomato, parsnip). Four of the isolates were identical with *Corticium praticola* [33, p. 722], which is renamed *Pellicularia praticola* nov. comb., while the remainder were referred to *P. filamentosa* [33, p. 367], in which both pathogenic and non-pathogenic forms were distinguished. Differences in spore and basidium measurements were as great within a strain as between strains, and length of sterigmata was found to be of little taxonomic value.

Muller (A. S.). **Elsinoe and Sphaceloma in Florida. I.**—*Plant Dis. Reptr*, 40, 3, pp. 256–257, 1956.

Included in this list, a supplement to that published previously [34, p. 186], of species of *Elsinoe* and *Sphaceloma* in Florida are *E. diospyri* on *Diospyros virginiana*, an additional host and a new record for the United States, *E. leucospila* on *Camellia sasanqua*, *E. parthenocissi* on *Parthenocissus quinquefolia* [cf. 35, p. 368], and *Sphaceloma oleanderi* on *Nerium oleander*, a new record for Florida.

Jørstad (I.). **Uredinales from South America and tropical North America. Chiefly collected by Swedish botanists.**—*Ark. Bot.*, 3, 14, pp. 443–490, 2 pl., 1956.

Of the 111 species of Uredinales, all collected by Lagerheim and other Swedish botanists in Ecuador, Brazil, Bolivia, and Cuba, except eight by Pringle in Mexico, described in this critically annotated list, 22 are new, and there are also a number of new host records. All the material except one collection is in the Swedish Museum of Natural History, Stockholm.

Carrera (C. J. M.). **El género Fusarium. Fusarium spp. nuevos o críticos de la República argentina y países limítrofes.** [The genus *Fusarium*. New or critical *Fusarium* spp. of the Argentine Republic and bordering countries.]—*Rev. Fac. Agron. B. Aires*, 13 (*1954*), 3, pp. 474–490, 10 figs., 1955. [English summary.]

The following species are described and their taxonomic status discussed in this further contribution to the author's critical studies on the genus *Fusarium* in Argentina and neighbouring countries [20, p. 235; cf. also 23, p. 230; 31, p. 411]: *F. decemcellulare* (conidial form of *Calonectria rigidiuscula* which has not been found in Argentina) on dead branches of *Anona* [*Annona*] *cherimoya*; *F. reticulatum* var. *negundinis* producing a discoloration of the wood of *Acer negundo*; *F. conglutinans* var. *betae* on chard (*Beta vulgaris* var. *cicla*); *F. bulbigenum* var. *niveum* on squash and melon; *F. oxysporum* on potato; *F.o.* var. *nicotianae* of great economic importance on tobacco; *F.o.* var. *aurantiacum* on peas (also in Brazil); *F. vasinfectum* f. 3 n.f. (syn. *F.o.* f. *crotalariae* [cf. 31, p. 19]), causing a wilt of *Crotalaria juncea*, *C. spectabilis*, *C. missouriensis*, *C. grantiana*, *C. lanceolata*, *C. incana*, and *C. striata* in Brazil; *F. v.* var. *perniciosum* n. comb. (*F.o.* f. *perniciosum*) on *Albizzia julibrissin* [32, p. 597]; and *F. solani* var. *eumartii* on potato.

Cunningham (G. H.). **Thelephoraceae of New Zealand. Part VII. The genus Lopharia. Part VIII. The genera Epithele and Mycobonia.**—*Trans. roy. Soc. N.Z.*, 83, 4, pp. 621–636, 6 figs., 1956.

In these further contributions [cf. 35, p. 398] the genus *Lopharia* is removed from the Hydnaceae and re-described under the Thelephoraceae, being characterized by a *Peniophora*-like microstructure and a pileate hymenophore. The type species, *L. cinerascens* (syn. *Thelephora cinerascens*), and *L. vinosa* (syn. *T. vinosa*) occur in New Zealand and are re-described.

The genus *Epithele* resembles *Corticium* except for the presence of fascicles, vertical columns of hyaline hyphae arising in the basal layer and traversing context and hymenium from which they project. The three species present in the Dominion include *E. nikau* n.sp. and *E. fulva* n.sp. *Mycobonia* differs from *Epithele* in having pileate fruit-bodies; the one endemic species, *M. disciformis*, is confined to living stems of *Rhopalostylis sapida*.

Sergeeva (Mme K. S.). Новый виды рода **Chaetomium.** [New species of the genus *Chaetomium*.] — Бот. Матер. (*Not. syst. Sect. crypt. Inst. bot. Acad. Sci. U.S.S.R.*), 11, pp. 108–118, 4 figs., 1956.

Four new species of *Chaetomium*, *C. perlucidum* on dead stems of herbaceous

plants, *C. crispatoideum* on prematurely fallen fruit of lime (*Tilia*), *C. senseri-citrulli* on leaf litter, and *C. angustispirale* on elm wood [in Latin diagnosis—ash in the Russian], are described.

Webster (B. N.) & Park (P. O.). **Developments in blister blight control. I. Introduction to the 1955 series of blister blight control experiments.**

Park (P. O.), Webster (B. N.), & Jennings (E. A.). **Developments in blister blight control. II. Spraying trials in 1955, using 50% copper fungicides. III. Dusting trials in 1955, using 4% copper blended dusts.**

Park (P. O.) & Webster (B. N.). **Developments in blister blight control. IV. Small scale assay of fungicides.** *Tea Quart.*, 27, 1–2, pp. 3–6; pp. 7–9, 1 graph; pp. 10–13, 2 graphs; pp. 14–19, 1 diag., 2 graphs, 1956.

Further investigations of blister blight of tea [*Exobasidium vexans*] are being carried out by the Tea Research Institute of Ceylon in conjunction with Messrs. Fisons Pest Control Ltd. [cf. 34, pp. 186, 263]. The first of the above papers notes that the experiments have been laid out to suit statistical analysis and describes the methods of sampling and the objectives of the trials with sprays and dusts. Spraying was done with Birchmeier 'Senior' hand-operated knapsacks with double nozzle, sapphire-lined jets, treating two rows at a time. Dusts were applied over four rows at a time with 'Orient' hand dusters.

The second deals with the 1955 spraying trials, which indicated that both copper oxide and copper oxychloride fungicides were equally efficient [cf. 36, p. 64]. In the third paper, on dusting trials, it is stated that satisfactory control was obtained with blended 4 per cent. copper dusts manufactured from locally produced materials. The 4 per cent. coated dust, blidust, was equally effective whether applied at six- or eight-day intervals.

The fourth paper deals with a small-scale method of assaying fungicides using plots of four tea bushes and a special, total delivery, hand sprayer, which is described. It was considered that in future plots of at least ten bushes will be better suited for such trials. All the copper compounds tested were effective, adhesive formulations having some advantages, but colloidal materials practically none. Non-copper fungicides were unsatisfactory [see next abstract].

Annual Administration Report for 1955–56 of the Scientific Department (Tea Section) of the United Planters Association of Southern India.—20 pp., [1956].

The report of the Botanist (K. S. Venkataramani, pp. 15–20) [cf. 35, p. 238] notes the occasional occurrence of branch canker (*Macrophoma theicola*) [34, p. 488] on tea in the Nilgiris. Blister blight (*Exobasidium vexans*) was better controlled by copper than by organic fungicides [see preceding abstract]. Further observations confirmed that resistance to *E. vexans* is due to hypersensitivity [30, p. 391].

Baker (R. F.). **Fine structure of Tobacco mosaic virus.**—*Nature, Lond.*, 178, 4534, pp. 636–637, 1 fig., 1956.

In electron microscope studies at the Gates and Crellin Laboratories of Chemistry, California Institute of Technology, and the Department of Medical Microbiology, University of Southern California, further evidence was obtained for the existence of a right-handed helical groove on the surface of rods of the U_1 and U_2 strains of tobacco mosaic virus [see following abstracts] which had been shadow-cast with thorium at an angle approaching 0°.

Matthews (R. E. F.), Horne (R. W.), & Green (E. M.). **Electron microscope observations of periodicities in the surface structure of Tobacco mosaic virus.**—*Nature, Lond.*, 178, 4534, pp. 635–636, 2 figs., 1956.

Further details of the structure of tobacco mosaic virus [see preceding and following abstracts] were elucidated in electron microscope studies at the Virus Research Unit, Molteno Institute, and the Cavendish Laboratory, University of Cambridge. Using a carbon replica technique, evidence was obtained of a structure repeating at 46 Å along the axis of the virus, which was polygonal in cross section, possibly hexagonal with a groove at each corner. A helical structure was observed in a few virus rods. In regions of close packing the width of the rods was about 150 Å.

Franklin (Rosalind E.). **X-ray diffraction studies of Cucumber virus 4 and three strains of Tobacco mosaic virus.**—*Biochim. Biophys. Acta*, 19, pp. 203–211, 6 figs., 1956.

The X-ray diffraction diagrams obtained at Birkbeck College Crystallography Laboratory, University of London, of three biologically distinct strains of tobacco mosaic virus [35, p. 638 and preceding abstracts], which were similar in chemical composition (one from Rothamsted and normal (U_1) and mild (U_2) strains from the University College of Los Angeles), and of cucumber virus 4 [strain of cucumber green mottle mosaic virus] from the Virus Laboratory, University of California, were very similar and differed only in small details. It was concluded that the helical arrangement [34, p. 551] of the virus protein was essentially the same in all four preparations, but there were slight variations in the number of protein sub-units in one turn of the helix and differences in the surface structure of the particles.

Fraenkel-Conrat (H.) & Williams (R. C.). **Reconstitution of active Tobacco mosaic virus from its inactive protein and nucleic acid components.**—*Proc. nat. Acad. Sci., Wash.*, 41, 10, pp. 690–698, 3 figs., 1 graph, 1955.

At the Virus Laboratory, University of California, Berkeley, the recombination of inactive protein sub-units from alkali-degraded tobacco mosaic virus [34, p. 551 and following abstracts] with inactive nucleic acid obtained by detergent degradation of the virus gave infective nucleoprotein rods. To reconstitute the virus, 1 ml. of 1 per cent. protein solution was mixed with 0·1 ml. of 1 per cent. nucleic acid solution, and opalescence appeared after the addition of a buffer, 0·01 ml. of pH 6 acetate (3M) being suitable. The samples were kept at 3° C. for 24 hours and then diluted and assayed, using *Nicotiana glutinosa*. The local lesions produced by 10 to 100 μg per ml. reconstituted nucleoprotein were indistinguishable from those produced by 0·1 μg tobacco mosaic virus. Evidence from the ultra-violet absorption spectrum and the electron microscope was sufficient to support the view that tobacco mosaic virus nucleic acid and protein sub-units were re-aggregated into rods, some of which were infective.

Fraenkel-Conrat (H.). **The role of the nucleic acid in the reconstitution of active Tobacco mosaic virus.**—*J. Amer. chem. Soc.*, 78, p. 882, 1956.

At the Virus Laboratory, University of California [see preceding and following abstracts], nucleic acid preparations from four distinct strains of tobacco mosaic virus were reactivated in five of the six possible combinations with protein from two of them and each of the resulting active virus preparations produced symptoms similar to the strain supplying the nucleic acid. The sixth combination, that between ordinary tobacco mosaic virus protein and nucleic acid from the Holmes rib grass strain resulted in a hybrid with the immunological properties of tobacco mosaic virus and producing the symptoms of the Holmes rib grass strain.

Hart (R. G.). **Infectivity measurements of partially degraded Tobacco mosaic virus.** —*Virology*, 1, 4, pp. 402–407, 1955. [Received November, 1956.]

At the Virus Laboratory, University of California, Berkeley, a purified preparation of tobacco mosaic virus [see preceding and next abstracts] retained between 10 and 25 per cent. of its original activity after a six-second heat treatment (at 85° C.) with the anionic detergent duponol C. Infectivity could then be further substantially reduced (by an estimated factor of 10 or more) by the incubation of the treated virus with ribonuclease [35, p. 639] for an hour at 37°. Most of the activity lost in this manner appeared from the results of control tests to be due to digestion of the nucleic acid exposed in the treatment, though this seemed to be only a small proportion of the amount contained in the intact virus.

Hart (R. G.) & Smith (J. D.). **Interactions of ribonucleotide polymers with Tobacco mosaic virus protein to form virus-like particles.**—*Nature, Lond.*, 178, 4536, pp. 739–740, 1 fig., 1956.

In further studies on the structure of tobacco mosaic virus at the Virus Laboratory, University of California [see preceding abstracts], the function of virus nucleic acid in cementing together the protein sub-units [see following abstracts] was investigated by studying the interaction of virus protein with a number of artificial and natural ribonucleotide polymers. The reaction mixtures were prepared by a method already described [loc. cit.] and allowed to stand overnight at about 5° C., then dialysed twice or more against distilled water at pH 7·6. Finally the mixture was centrifuged for 45 minutes at $10^5 g$ and the resulting pellets resuspended in distilled water for examination with the electron microscope. All the preparations containing nucleotide polymers aggregated into rods of the same apparent width as tobacco mosaic virus but of various lengths, which appeared to be independent of the molecular weight and composition of the ribonucleic acid. None of the preparations gave local lesions on *Nicotiana glutinosa*, nor were symptoms obtained on a number of other test plants.

It is concluded that the biological action of tobacco mosaic virus nucleic acid depends on the exact arrangement of its nucleotide residues but that this arrangement does not affect the ability of any ribonucleic acid to form stable, organized complexes with tobacco mosaic virus protein.

Lippincott (J. A.) & Commoner (B.). **Reactivation of Tobacco mosaic virus infectivity in mixtures of virus protein and nucleic acid.**—*Biochim. Biophys. Acta*, 19, pp. 198–199, 1956.

At the Henry Shaw School of Botany, Washington University, St. Louis, preparations of dissociated protein of tobacco mosaic virus [see preceding and next abstracts] were obtained by the method of Schramm *et al.* [34, p. 489] and mixed with separated nucleic acid. The resulting product thus contained any residual tobacco mosaic virus remaining after purification plus any new infectious material formed from the separate components prepared by polymerization with ammonium sulphate. In infectivity tests on *Nicotiana glutinosa* significantly more local lesions were produced by the reactivated virus mixture than by the controls (each component separately, and the two together without polymerization). It was concluded that the reactivation process restored to relatively uninfectious preparations of tobacco mosaic virus protein and nucleic acid a significant amount of infectivity, and compared with the standard normal tobacco mosaic virus used in the experiment this added infectivity was equal to that expected from 40 to 250 μg. tobacco mosaic virus.

Two explanations of these results are put forward, viz., that the infectivity, and thus the genetic specificity of tobacco mosaic virus, is a joint property of the

protein and nucleic acid and that the infectivity obtained in artificial mixtures results from recombination into a nucleoprotein identical with the virus, or, alternatively, the protein or nucleic acid alone may carry the biological activity of the virus, the other constituent serving only to protect the active material from degradation.

Commoner (B.), Lippincott (J. A.), Shearer (Georgia B.), Richman (Ellen E.), & Wu (J.-H.). **Reconstitution of Tobacco mosaic virus components.**—*Nature, Lond.*, 178, 4537, pp. 767–771, 1 fig., 2 graphs, 1956.

In this further contribution from the Henry Shaw School of Botany, Washington University [see preceding abstract], a new method of preparing reconstituted tobacco mosaic virus is described which yields a product approaching one-tenth of the infectivity of natural tobacco mosaic virus, compared with less than one-hundredth by the old method [loc. cit.]. The number of lesions produced on *N[icotiana] glutinosa* was 1,000 times greater than that produced by uncombined tobacco mosaic virus protein and nucleic acid. Significant differences in the physical properties of the infectious nucleoprotein in different fractions of reconstituted material and natural tobacco mosaic virus were observed, which were attributed to genetic changes. The biological properties of the reconstituted virus were also aberrant, a number of unusual symptoms being induced in tobacco plants systemically infected with the preparation, including strap leaves, bright yellow mosaic, pale green mosaic followed by necrosis, and circular necrotic lesions on the inoculated leaf. None of these symptoms was found among comparable plants inoculated with ordinary tobacco mosaic virus.

From these and other data it is concluded that the reconstitution process yields heterogeneous nucleoprotein which may be employed in the investigation of correlations between composition and biological activity.

Basler (E.) & Commoner (B.). **The effect of Tobacco mosaic virus biosynthesis on the nucleic acid content of Tobacco leaf.**—*Virology*, 2, 1, pp. 13–28, 6 graphs, 1956.

At the Henry Shaw School of Botany, Washington University, St. Louis, the nucleic acid contents of tissue cultures of tobacco leaf infected with tobacco mosaic virus [33, p. 264 and next abstract] and of uninfected tissue were compared. Virus infection affected only the buffer-insoluble fraction of the leaf homogenates, and before free tobacco mosaic virus appeared the nucleic acid of this fraction in infected tissue exceeded that in uninfected by an amount slightly in excess of that found in the maximum concentration of virus formed. This excess disappeared with the formation of free virus and a nucleic acid deficiency developed until, at the end of the infection process, the difference due to infection was almost nil. Further analyses showed that the excess of guanine was about twice that required for tobacco mosaic virus formation while the excesses of uracil, cytosine, and adenine were about equal to the amounts finally found in the virus nucleic acid.

From these results it is concluded that the excess nucleic acid appearing before the formation of free tobacco mosaic virus is a precursor of virus nucleic acid, though degradation of host nucleic acid is also involved in virus reproduction.

Commoner (B.) & Basler (E.). **Variations in the nucleic acid composition of Tobacco mosaic virus.**—*Virology*, 2, 4, pp. 477–495, 1 diag., 9 graphs.

An examination at the Henry Shaw School of Botany, Washington University, Missouri, of 55 separately produced and highly purified preparations of a single strain of tobacco mosaic virus [see preceding abstracts] showed that the total nucleic acid content and molar proportions of the individual nitrogen bases varied

from one preparation to another, being dependent on the duration of the infectious process up to the time of sampling and the character of the tissue from which the virus was isolated.

Bancroft (J. B.) & Pound (G. S.). **Cumulative concentrations of Tobacco mosaic virus in Tobacco and Tomato at different temperatures.**—*Virology*, 2, 1, pp. 29–43, 1 fig., 3 graphs, 1956.

A preliminary account of this work at the Department of Plant Pathology, University of Wisconsin, has already appeared (Bancroft, J. B., & Pound, G. S., abs. in *Phytopathology*, 44, pp. 481–482, 1954). The concentration of tobacco mosaic virus [see next abstract] in inoculated leaves, tip leaves, and composite leaf samples of systemically infected susceptible and resistant tobacco and Bonny Best tomato and in roots and composite stem and leaf samples of tomato increased with an increase in air temperature from 16° to 28° C. and was higher during periods of severe symptom expression than when the symptoms were mild.

When soil temperatures were increased virus concentrations in inoculated resistant tobacco (seedling D-534) also increased initially within the range 16° to 28°, but in the susceptible Connecticut Havana 38 the highest concentrations occurred with soil at 16°. In studies on the combined effects of soil and air temperatures, soil temperature was less important in determining initial virus concentration in the inoculated leaves and composite samples of all the leaves than air temperature. In resistant tobacco the highest virus concentration was always found at the upper temperatures, when the severest symptoms were produced.

There was a definite correlation between host growth and virus concentration until the maximum concentration was reached, after which it decreased as host growth increased.

Pound (G. S.) & Bancroft (J. B.). **Cumulative concentrations of Tobacco mosaic virus in Tobacco at different photoperiods and light intensities.**—*Virology*, 2, 1, pp. 44–56, 1 fig., 2 graphs, 1956.

In this further contribution from the University of Wisconsin [see preceding abstract] it is reported that the concentration of tobacco mosaic virus in inoculated and systemically infected tobacco leaves was greater four days after inoculation when day length was 12 or 16 hours than when it was four or eight hours. Between 18 days and 4 weeks after inoculation the position was reversed. High light intensity (up to 450 ft.-candles) favoured the multiplication of the virus in inoculated leaves [cf. 35, p. 583], and initially in tip leaves. At four days after inoculation in summer the concentration in composite samples increased with light intensity while the reverse was true after 28 days and also in winter.

Virus multiplication in inoculated tobacco leaf disks cultured on water agar at 29° C. was inhibited to almost the same extent by intense light for 16 hours per day as by no light. Equivalent amounts of light energy received as long days of diffuse light were more favourable to virus multiplication than short days of intense light. Under these conditions the optimum for multiplication was 1,100 ft.-candles for 16 hours per day.

Helms (Katie) & Pound (G. S.). **Zinc nutrition of Nicotiana tabacum L. in relation to multiplication of Tobacco mosaic virus.**—*Virology*, 1, 4, pp. 408–423, 2 figs., 1956.

At the Department of Plant Pathology, University of Wisconsin, the concentration and symptom expression of tobacco mosaic virus [see preceding and next abstracts] in Havana 38 tobacco plants decreased as the zinc level was lowered. Zinc deficiency symptoms increased following inoculation with the virus. The

multiplication of the virus is apparently associated with either the utilization of zinc or its withdrawal from the infected leaves, as already indicated by other workers [cf. 15, p. 176; 32, p. 363; 34, p. 16], who concluded that the element affected virus synthesis indirectly through its action on the host.

Siegel (A.) & Wildman (S. G.). **The inactivation of the infectious centres of Tobacco mosaic virus by ultraviolet light.**—*Virology*, 2, 1, pp. 69–82, 7 graphs, 1956.

The sensitivity of two strains of tobacco mosaic virus, U_1 and U_2 [34, p. 110; 35, p. 724] to ultra-violet light [35, p. 851] was investigated at the Botany Department, University of Los Angeles, California, using half-leaves of *Nicotiana glutinosa*. Extracted virus was irradiated in phosphate buffer solutions 1 to 2 mm. thick, inoculated detached leaves being placed on damp cotton wool. A Westinghouse Sterilamp (output primarily 2,537 Å) was used at a distance of 25 cm. Each sample was replicated in 24 half-leaves, arranged to reduce to a minimum variation due to the use of different plants, leaves at different levels on the same plant, and the two halves of the same leaf. After irradiation the leaves were left in moist chambers in the greenhouse for three to five days, by which time the lesions were large enough to count.

The two strains differed $5\frac{1}{2}$ times in their *in vitro* sensitivity to inactivation, the *in vivo* results for each strain closely matching these, showing that the course of infection in the leaf was due to the effect of ultra-violet light on the virus and not on the host. On the basis of experimental results it was concluded that the three phases of infection prior to virus multiplication take five hours in *N. glutinosa* leaves at 20° C., the time decreasing with a rise in temperature. When new infective particles first appear their numbers double in two hours. It is postulated that during the first phase the virus particle remains on the leaf surface and is exposed to the full irradiation, in the second it enters the cell and is screened by the cell wall and cytoplasm, while the third phase occupies the time during which the particle is in the cell prior to multiplication. On this basis it seems that the course of infection could be prevented by treatment to remove virus without damaging the leaf, as by washing with water, and has already been demonstrated [35, p. 865]. The observed data also support the conclusion that a single infective particle is sufficient to initiate an infection.

Takahashi (W. N.). **Anomalous proteins associated with three strains of Tobacco mosaic virus.**—*Virology*, 1, 4, pp. 393–396, 1 fig., 1 graph, 1955. [Received November, 1956.]

In further studies at the Department of Plant Pathology, University of California, Berkeley, three separate strains of tobacco mosaic virus [see preceding abstracts], severe, mild, and Holmes's rib grass, induced the formation of anomalous proteins in Turkish tobacco plants [32, p. 593; cf. 35, p. 127 *et passim*]. Characterized by electrophoresis, these proteins were found to be different and specific for each strain of the virus. All were polymerized into rods of similar appearance to those of tobacco mosaic.

Pirie (N. W.). **Some components of Tobacco mosaic virus preparations made in different ways.**—*Biochem. J.*, 63, 2, pp. 316–325, 1956.

At Rothamsted Experiment Station a method was devised for freeing tobacco mosaic virus preparations from contamination with leaf nucleoprotein [35, p. 867]. When they were incubated part of the phosphorus became soluble in trichloroacetic acid, possibly due to the fission of leaf nucleoprotein by ribonuclease. During the purification process some of the virus properties, including the precipitability by ammonium acetate, were altered. Plant ribonuclease may be almost entirely

removed by ultracentrifugation from salt solutions in the presence of nucleic acid; the residual nuclease can be detected by tobacco mosaic virus which has been denatured by trichloroacetic acid.

Hirth (L.) & Segretain (G.). **Quelques aspects de la multiplication du virus de la mosaïque du Tabac en culture de tissus.** [Some aspects of the multiplication of Tobacco mosaic virus in tissue culture.]—*Ann. Inst. Pasteur*, 94, 4, pp. 523–536, 1956. [English summary.]

Of the amino acids and purine bases investigated for their action on the multiplication of tobacco mosaic virus in crown gall (*A[grobacterium] tumefaciens*) tissue culture [35, p. 331], only aspartic and glutamic acids were active, the former inhibiting and the latter promoting the process. The influence of coco-nut milk was more complex, involving antagonism between two independent actions, stimulatory on the tissues and repressive on the virus.

Owen (P. C.). **The effect of infection with Tobacco mosaic virus on the respiration of Tobacco leaves of varying ages in the period between inoculation and systemic infection.**—*Ann. appl. Biol.*, 44, 2, pp. 227–232, 1956.

The results of the author's experiments at Rothamsted Experimental Station on the respiration of tobacco leaves infected with tobacco mosaic virus have already been noted [35, p. 867]. He concludes that increased respiration was unrelated to the quantity of virus produced and that the rate rose within one hour of inoculation owing to entry of the virus into the epidermal cells, reflecting some reaction of the cell preparatory to virus synthesis. The subsequent decrease in respiration may be due to the accumulation of virus that does not contribute to the total leaf respiration.

Limberk (J.). **Einfluß des Heteroauxins auf die Bewegung des Alke-Stammes des gewöhnlichen Tabakmosaiks (VTM) in der Tabakpflanze.** [Influence of heteroauxin on the movement of the Alke strain of ordinary Tobacco mosaic (TMV) in the Tobacco plant.]—*Czech. Biol.*, 3, pp. 322–324, 1954. [Russian. Abs. in *Z. PflKrankh.*, 63, 10, pp. 593–594, 1956.]

In tobacco plants infected by rubbing with sap containing the Alke strain of tobacco mosaic virus, symptoms developed only above the inoculated leaf, mostly on the apical leaves. After decapitation and rubbing with lanoline paste containing both infected sap and heteroauxin, the symptoms appeared first on the basal shoots. The same treatment without the addition of heteroauxin resulted mainly in involvement of the upper leaves. The incorporation of the growth substance accelerates the movement of the virus and changes its direction, the particles being passively swept along with the heteroauxin.

Rhodes (G. N.), Mullett (R. P.), & Matthews (J. N.). **Results of wildfire test demonstration control treatments with streptomycin sulphate.**—*Plant Dis. Reptr*, 40, 3, pp. 202–204, 1956.

Experiments carried out in a number of counties by the Agricultural Experiment Station, University of Tennessee, Knoxville, showed that four weekly sprays of 100 p.p.m. streptomycin sulphate (10 gals. per 9 by 100 ft. bed) were superior to the standard tri-basic copper treatment in preventing tobacco wildfire (*Pseudomonas tabacum*) [35, p. 795], although they did not give complete protection in all the beds. Similar applications of a 0·2 per cent. streptomycin dust (1½ lb.) also retarded infection in some beds.

In eradication trials a 200 p.p.m. spray (10 gals.) on beds with natural infections eliminated all visible wildfire. The 0·2 per cent. dust (3 lb.) was slightly less effective.

Gigante (R.). **La virescenza ipertrofica del Tabacco.** [Hypertrophic virescence of Tobacco.]—*Tabacco*, 60, 679, pp. 167–178, 7 figs., 1956. [English summary.]

In the autumn of 1955, Maryland tobacco plants growing in the vicinity of Rome developed characteristic symptoms of infection by tomato big bud virus [32, p. 423]. It is recommended that the affected plants should be destroyed, together with the wild plants and weeds growing near them.

Canova (A.) & Govi (G.). **Imbrunimento interno dei frutti di Pomodoro.** [Internal browning of Tomato fruit.]—*Frutticultura*, 17, 1, pp. 67–73, 1 col. pl., 4 figs., 1955.

A disease of tomato strongly resembling internal browning [29, p. 63] has recently been reported from various parts of Italy. From the positive results of inoculations to tomato the authors conclude that it is caused by a virus, which may be the strain of tobacco mosaic virus described by Holmes [29, p. 64] or a closely related strain.

Ciccarone (A.). **Prove di lotta contro la 'fusariosi' del Pomodoro, con particolare riguardo all' uso del bromuro di metile come fumigante del suolo.** [Control tests on *Fusarium* disease of Tomato, with particular reference to the use of methyl bromide as a soil fumigant.]—Reprinted from *Tecn. agric.*, *1955*, 11–12, 12 pp., 4 figs., 1955.

Fumigation tests at the Institute of Pathology of the University of Catania revealed that methyl bromide and chloropicrin [34, p. 407] were effective soil fumigants against wilt disease of tomato caused by *Fusarium bulbigenum* var. *lycopersici*. The methyl bromide, applied at 60 gm. per sq. m., should be mixed with 2 per cent. chloropicrin (which is considerably more expensive). Planting may be begun within 2 to 3 days of application.

Phillips (D. H.). **Tomato seed transmission of Didymella lycopersici Kleb.**—*Trans. Brit. mycol. Soc.*, 39, 3, pp. 319–329, 2 graphs, 1956.

Studies on *Didymella* stem rot of tomatoes (*D. lycopersici*) in Jersey [35, p. 243; and next abstract] confirmed that the presence of the pathogen on the seed [36, p. 4] had no connexion with the incidence of stem rot in the subsequent crop.

Phillips (D. H.). **Soil-borne infection of Tomatoes by Didymella lycopersici Kleb.** —*Trans. Brit. mycol. Soc.*, 39, 3, pp. 330–340, 1956.

The results of experiments demonstrating the importance of *Didymella lycopersici* on the remains of the old tomato crop as a source of infection have already been noticed [35, pp. 243, 656]. In pot experiments little or no loss occurred among the test plants in soil collected five months or more after the removal of the previous crop. In the field, heavy losses were suffered when inoculum was buried in the plots six to nine months before planting, the more so if buried shortly before, simulating conditions that obtain in Jersey when the remains of the old crop are ploughed in just prior to spring planting. The importance of removing crop residues is therefore evident.

Boelema (B. H.) & Gelderblom (J. P. B.). **Blights and bacterial spot of Tomatoes.** —*Fmg in S. Afr.*, 32, 7, pp. 15–18, 3 figs., 1956.

This paper contains notes on fungicides tested at the Horticultural Research Station, Pretoria, for tomato disease control, and briefly describes the symptoms of the following four diseases: early blight (*Alternaria solani*) [15, p. 265], *Septoria* leaf spot (*S. lycopersici*) [11, p. 210], late blight (*Phytophthora infestans*) [32, p. 346], and bacterial spot (*Xanthomonas vesicatoria*) [map 269]. Spraying with cuprous oxide, zineb, captan, maneb, or Bordeaux mixture at 4–2–50 (2–1–50

for seedlings and young plants) is recommended. Thiram proved effective when used weekly, but fortnightly applications were disappointing.

Richardson (R. W.). **Cotaxtla –1, una nueva variedad de Jitomate para las llanuras de Veracruz.** [Cotaxtla –1, a new variety of Tomato for the flatlands of Veracruz.]—*Foll. Divulg. Secret. Agric. Méx.* 21, 17 pp., 4 figs., 1956.

Cotaxtla –1, the first variety of tomato to be developed especially for Mexican conditions, originated in a strain of Perfection de Hurff and was genetically perfected in the 'El Horno' Experimental Station, Chapingo, in 1952. It is best suited to the tropical coastal area. Though it is susceptible to grey mould [?*Cladosporium fulvum*: 33, p. 508], *Phytophthora infestans* [31, p. 372], and losses during transport, control by fungicides has been successful in the two latter cases and yield under conditions of high *C. fulvum* incidence was better in 1956 than that of Rutgers.

Hoover (M. M.), Alexander (L. J.), Paddock (E. F.), & Dodge (A. F.). **Horticultural characters and reaction to two diseases of the Lycopersicon accessions in the north central region.**—*Bull. Ohio agric. Exp. Sta.* 765, 64 pp., 1955.

At the Ohio Agricultural Experiment Station, Wooster, 1,253 accessions of the genus *Lycopersicon* [32, p. 700; 34, p. 265] have been assembled, including parental breeding material and genetic stocks, and classified under species and their varieties for reaction to tobacco mosaic virus (to which *L. hirsutum* var. *glabratum* proved resistant) and *Alternaria solani*. Evaluation was also made by horticultural characters. The tabulated data are appended. Seed can be obtained from the Regional Plant Introduction Station at Ames, Iowa.

Brook (P. J.). **Spray experiments to control Botrytis cinerea on Tomatoes.**—*N.Z.J. Sci. Tech.*, Sect. A, 38, 2, pp. 124–128, 1956.

At the Plant Diseases Division, Auckland, New Zealand, thiram gave the most satisfactory control of *Botrytis cinerea* on glasshouse tomatoes [see next abstract], fortnightly applications at 0·1 per cent. reducing the percentage fruit infection from 23 (untreated) to 4·9 and that of the vegetative tissue from 15·7 to 4·1 while increasing the yield of sound fruit from 2·83 lb. per plant to 3·97. Ziram (0·28 per cent.) gave significant control on the fruit (11·2 per cent. infection), but not on the leaves and stems, and the yield was poor. Captan at 0·2 per cent. failed to check fruit infection sufficiently, although it reduced that of the vegetative tissue to 6 per cent. and increased the yield to 3·65 lb., while at 0·1 per cent. the reduction in fruit infection (to 12·1 per cent.) was significant, but not the other results.

Newhook (F. J.) & Davison (R. M.). **Incorporation of fungicides in fruit-setting sprays for control of Botrytis fruit rot in glasshouse Tomatoes. I. Introduction and screening trials. II. Compatibility of mixtures. III. Tests in commercial houses.**—*N.Z.J. Sci. Tech.*, Sect. A, 38, 2, pp. 166–183, 9 figs., 1956.

Experiments carried out by the Plant Diseases Division and the Fruit Research Station, Auckland, New Zealand, showed that it is possible to include a fungicide in fruit-setting sprays on glasshouse tomatoes to protect the petals against infection by *Botrytis cinerea* [see preceding abstract], which often develops after these sprays are applied [32, p. 648].

In laboratory screening trials, petals glued across the undersides of holes in a metal holder were sprayed with a mixture of fungicide and fulset (β-naphthoxyacetic acid), dried, and dusted with *B. cinerea* spores. A small block of agar was placed over each hole and examined for fungus growth after incubation. Effective materials were then tested on potted plants. Ferbam (0·35 per cent.), thiram (0·3), and ziram (0·28), applied with fulset to the flowers twice at an interval of

seven to ten days, reduced the percentage fruit rot from 82·8 (fulset only) to 1·8, 0, and 3·6, respectively, compared with 1·9 per cent. when the petals were removed by hand. The systemic fungicides tested all proved unsatisfactory.

In compatibility tests in the greenhouse, the addition of ferbam (0·28 to 0·42 per cent.), thiram (0·3), ziram (0·3), captan (0·2), and dichlone (0·05) to fulset sprays had no adverse affect on the size, number, yield, or quality of the fruit. Similar results were obtained by incorporating the first four fungicides with tomatone (parachlorophenoxyacetic acid). Serious injury followed fulset sprays plus copper 8-quinolinol at 0·1 and 0·2 per cent., and the addition of 0·56 per cent. ferbam or 0·1 per cent. dichlone affected the first truss in one test.

Experiments under commercial conditions showed that for maximum protection the truss sprays should be applied so that each flower receives at least two fungicide applications, the first, for which ferbam (0·35 per cent.) and thiram (0·3) are the most suitable, in a combined spray with the growth substance and the second in a spray of fungicide alone seven to 12 days after setting. The latter can be supplied either by special truss sprays or by overall sprays for *Botrytis* control. Overall sprays, however, do not replace the inclusion of fungicides in the hormone sprays.

Serrano (S. L.). **Posible inducción de resistencia del Tomate al Phytophthora infestans (Mont.) de Bary mediante auxinas.** [Possible inducement of resistance of Tomato to *Phytophthora infestans* (Mont.) de Bary by means of auxins.]—*Acta agron. Palmira*, 5, 2, pp. 117–134, 8 figs., 1955. [English summary.]

At the Palmira Agricultural Experiment Station, Colombia, potted tomato plants were dipped in solutions of five growth substances and inoculated 4, 8, and 12 days later with *Phytophthora infestans*. All the compounds induced some degree of resistance to infection. Indole-3-acetic acid (500 p.p.m.) and the potassium salt of indole-3-butyric (200 p.p.m.) were most effective when used 4 days, and 2,4,5-T (5 p.p.m.) and α-naphthaleneacetic acid (50 p.p.m.) 12 days, before inoculation.

Indole-3-acetic and α-naphthaleneacetic acids and indole-3-butyric salt caused stem-twisting and leaf-curling. 2,4,5-T and 2,4-D (5 p.p.m.) had no morphological effect.

Limasset (M. P.). **Observation sur les maladies à virus de la Tomate dans le midi et le sud-ouest de la France.** [Observations on virus diseases of the Tomato in south and south-west France.]—*C. R. Acad. Agric. Fr.*, 41, 14, pp. 599–603, 1955.

The author reports on the virus diseases of tomato identified in south and south-west France in the summer of 1955. Tobacco mosaic virus was present on many crops, affecting a considerable proportion of the plants. Cucumber mosaic virus was frequent in tomatoes planted close to melon, cucumber, or gherkin. Potato virus Y [33, p. 12] was found most frequently on tomatoes following potatoes, and caused considerable losses in some crops.

Potato virus X was seen only once, a virulent strain in tomato following potato. In some parts of the field nearly all the plants were affected, which was considered surprising as the crop, destined for canning, had not undergone any of the cultural procedures normally considered responsible for the spread of the virus.

Tomato spotted wilt virus was suspected in certain market gardens, but not confirmed.

Ansiaux (J. R.). **Symptômes provoqués chez la Tomate par une double carence cationique.** [Symptoms induced in the Tomato by a dual cationic deficiency.] —*Bull. Acad. Belg. Cl. Sci.*, Sér. 5, 42, 5, pp. 664–675, 1956.

In water-culture experiments at the Laboratory of Plant Physiology, University

of Brussels, Tuckswood tomato plants deprived of two out of three major elements —potash, calcium, and magnesium—developed the symptoms typical of each deficiency in a more or less pronounced form according to the single cation present. In certain cases a tendency for one symptom to be masked by another was observed. A severe disorder of the floral system and fruits, presenting analogies with blossom-end rot, resulted from lack of calcium.

Georgescu (C. C.) & Orenschi (S.). **Contribuții la studiul sistematic și fiziologic al ciupercii Verticillium albo-atrum R. et B.** [Contribution to the systematic and physiologic study of the fungus *Verticillium albo-atrum* R. et B.]—*Bul. Și. Acad. Repub. rom.*, 8, 1, pp. 117–130, 2 figs., 7 graphs, 1956. [Russian and French summaries.]

Verticillium albo-atrum is stated to be responsible for severe infection of *Cotinus coggyria* in the forest protection plantings of the steppe regions in Romania. The external symptoms and the process of wood injury are described. Affected branches of *C. coggyria* and *Acer tataricum* were compared. A difference in the form of the conidia was noticed when grown on liquid media, those from *C. coggyria* branches being ovoid and measuring 4·4 by 4·2 μ and those from *A. tataricum* being elongated and 6·5 by 3·1 μ. On this basis two forms are distinguished within the species *V. albo-atrum*, namely f. *cotinus* and f. *acer*. Certain differences in physiological behaviour and nutritional requirements were also observed in culture.

Zaleski (K.) & Golenia (A.). **Grzyby nadrzewne — pasożyty i saprofity — zebrane w Państwowym Nadleśnictwie Kórnik (woj. poznańskie) w latach 1948–1949.** [Wood fungi—parasites and saprophytes—collected in the Kórnik State Forest (prov. Poznań) in 1948–1949.]—*Acta Soc. Bot. Polon.*, 23, 3, pp. 617–634, 1954. [English summary.]

During a survey of the State forests in Kórnik, Province Poznań, Poland, carried out from 1948 to 1949 by the Institute of Phytopathology of the Poznan University [cf. 34, p. 113] 105 species of fungi, listed here with annotations, parasitic and saprophytic on living trees and dead wood, were found, ten of which are new records for Poland. These include *Peniophora cremea* on hornbeam, *Pholiota unicolor* on alder, *P. lucifera* on birch, *Flammula* [*Pholiota*] *fusa* on aspen (*Populus tremula*), *Crepidotus scalaris* on pine (*Pinus sylvestris*), and *Pleurotus dryinus* on oak (*Quercus pedunculata*) [*Q. robur*] and on birch.

Bakshi (B. K.), Puri (Y. N.), Sharma (R. P.), Singh (S.), & Singh (B.). **New and noteworthy diseases of trees in India.**—*Indian For.*, 82, 9, pp. 449–454, 1 pl., 3 figs., 1956.

Descriptions are given of the morphology and cultural characters of three fungi causing tree diseases of economic importance in India. *Polyporus tulipiferae* [cf. 34, p. 334], not previously reported from India, was found to be a weak, wound parasite of chestnut, white mulberry, and *Cassia javanica* in the Uttar Pradesh, and was collected on dead wood of *Betula* sp. in Punjab and on mango in Dehra Dun. A white spongy sap wood rot with black zone lines is typical of decay by this fungus. *Hypoxylon ustulatum* (syn. *Ustulina vulgaris* [*U. deusta*: 34, p. 544]), which causes a similar rot but not spongy, is common on rubber, tea, and *Bauhinia purpurea* where it is often associated with *P.* [*Fomes*] *lignosus* [cf. 35, pp. 324, 392].

P. rubidus, usually reported on dead wood, attacked some 80 per cent. of chestnut trees in an orchard in Dehra Dun. Infection arises through injuries caused by the breaking off of branches. *Eucalyptus citriodora*, an avenue tree, the lower branches of which are lopped, was similarly affected. Only the heartwood is attacked, a

brown cuboidal rot developing. Treating injured areas with a fungicide soon after lopping should give adequate protection. The fungus was also collected on living teak.

Englerth (G. H.), Boyce (J. S.), & Roth (E. R.). **Oak wilt fungus can be killed by steaming or kiln drying.**—*Sth. Lumberm.*, 192, p. 46, 1956. [Abs. in *For. Abs.*, 17, 4, p. 553, 1956.]

Six months after boards were cut from diseased but living oaks, the wilt pathogen [*Chalara quercina*: 35, p. 337] was still viable in them, but was not able to survive in timber with a moisture capacity below 20 per cent. Steaming or kiln-drying gave effective control. Sodium pentachlorophenate prevented *C. quercina* from attacking sound timber but was not lethal.

True (R. P.) & Gillespie (W. H.). **Few fungus mats form on Oak wilt trees girdled to the heartwood in West Virginia.**—*Plant Dis. Reptr*, 40, 3, pp. 245–248, 1956.

In preliminary trials in West Virginia in 1954 (*Curr. Rep. W. Va agric. Exp. Sta.* 8, 1955) a reduction in mat formation by the oak wilt fungus (*Endoconidiophora fagacearum*) [*Chalara quercina*: 35, pp. 248, 403] was obtained by introducing a saturated solution of copper sulphate into the vascular system of standing diseased trees through a basal girdle. The reduction was even greater when comparable trees were given a dry girdle which extended to the heartwood, only one of the six trees thus treated producing a few mats.

The present experiments indicate that dry-girdling is most effective in preventing mat formation if carried out before 1st August. It is superior to methods requiring felling, as the wounding of other trees by the one falling is avoided, and it is easy to perform in mountainous areas at the time of field diagnosis.

Murphy (D. R.). **Dissemination studies and chemical control of Oak wilt.**—Abs. in *Iowa St. Coll. J. Sci.*, 30, 3, pp. 417–418, 1956.

In further studies at the Iowa Experimental Station on dissemination and control of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: 35, p. 853 *et passim*] the fungus was not recovered from any of the birds tested as possible vectors. Ten per cent. propylene glycol butyl ether ester of 2,4,5-T in fuel oil gave the best top kill when applied as a basal spray to frilled, dormant red oak trees (*Quercus rubra*). Of 11 chemicals applied to the foliage of 6 year-old trees malachite green, merculine '100', and mercupron showed therapeutic promise [cf. 35, p. 403].

Rodigin (M. N.). О редком грибке — **Phyllactinia roboris (Gachet) Blum.** на листьях **Quercus robur L.** [A rare fungus—*Phyllactinia roboris* (Gachet) Blum. on leaves of *Quercus robur* L.] — Бот. Матер. (*Not. syst. Sect. crypt. Inst. bot. Acad. Sci. U.S.S.R.*), 11, pp. 103–104, 1956.

Phyllactinia roboris (*P. suffulta* f. *quercina*), reported as a new record on oak in the U.S.S.R., is described. The fungus was found on the leaves of *Quercus robur* in the vicinity of Ufa, Bashkir, in October, 1952.

Oak mildew.—*Leafl. For. Comm., Lond.*, 38, 6 pp., 3 figs., 1956.

This is a description of *Microsphaera alphitoides* and its incidence and importance in Great Britain, where it is the most harmful fungus on oak leaves, particularly in the nursery [27, p. 395]. Overwintering probably takes place by means of the bud mycelium. The best control is by colloidal sulphur sprays [32, p. 348].

Banerjee (S.). **An Oak (Quercus robur L.) canker caused by Stereum rugosum (Pers.) Fr.**—*Trans. Brit. mycol. Soc.*, 39, 2, pp. 267–277, 2 pl., 1 fig., 1956.

A previously unreported canker was observed on oaks in a plantation at Dawyck,

near Edinburgh, Scotland, due to *Stereum rugosum* [cf. 13, p. 334]. The cankers were found on the trunks of 50- to 60-year-old trees growing in a damp, shady situation; the crown growth was poor and the trees appeared moribund. *S. rugosum* was isolated from the edges of cankers and inoculations on wounded bark of a healthy tree were positive. In laboratory studies the fungus was able to attack sapwood more readily than heartwood.

Pereda (F. C.). **Hadromicosis del Alamo producida por Verticillium albo-atrum (R. y. B.).** [Hadromycosis of Poplars produced by *Verticillium albo-atrum* R. & B.]—*Idia*, 96, pp. 22–24, 1955. [Abs. in *For. Abs.*, 17, 4, p. 553, 1956.]

During 1953 *Populus* 'A.M.' growing in the south of Buenos Aires province, Argentina, was attacked by *Verticillium albo-atrum*. In experiments the fungus was pathogenic to both the stem and injured roots through the soil.

Martínez (J. B.). **Hongos y enfermedades de los Chopos en España, incluyendo pudriciones y alteraciones cromogenas de su madera.** [Fungi and diseases of Poplars in Spain, including rots and timber stains.]—[*Publ.*] *F. A. O., Roma* 55/4/2396, 17 pp., 1955.

This paper, presented at the eighth period of sessions of the International Poplar Commission [34, p. 495] held in Madrid from 25th to 28th April, 1955, contains a systematic list of the fungi recorded in the literature as having been found on cultivated poplars in Spain [35, p. 404], plus a number of new records, brief notes on the principal diseases of (*a*) the leaves and (*b*) the trunks and branches caused by fungi, bacteria, and viruses, an annotated, tabulated list of wood-rotting fungi and the rots they cause, and notes on staining of timber.

Didymosphaeria theodulina is considered distinct from *D. populina* and is redescribed.

Wöstmann (E.) & Goossen (H.). **Bekämpfungsversuche gegen Dothichiza populea mit Fungiziden.** [Control experiments against *Dothichiza populea* with fungicides.]—*Holz- u. Forstw.*, 11, 17, pp. 371–372, 1 fig., 1 diag., 1956.

On the basis of one year's experiments (1955) on the control of *Dothichiza populea* in a poplar nursery 8,500 sq. m. in extent in the Westphalia-Lippe silvicultural area of Germany [33, p. 695], the authors make the following provisional recommendations. Three or four applications at two- to three-weekly intervals of 1 per cent. copper oxychloride (containing 50 per cent. copper), 0·72 per cent. copper oxide (70 per cent.), or 0·2 per cent. of an [unnamed] mercurial should be given between the end of June and the beginning of August in the year before transplanting. Captan and zineb failed to influence the course of the disease.

Domanski (S.). **Badania nad biologią Fomes igniarius (Linn.) Fr. na Białodrzewie (Populus alba L.).** [Observations on the biology of *Fomes igniarius* (Linn.) Fr. on White Poplar (*Populus alba* L.).]—*Acta Soc. Bot. Polon.*, 23, 3, pp. 589–616, 7 figs., 3 graphs, 1954. [English summary.]

An examination of a 77-year-old white poplar (*Populus alba*) infected with *Fomes igniarius* [cf. 25, p. 238; 32, p. 348, *et passim*] in Poland revealed the presence of the incipient, intermediate, and final stages of rot (all of which are described). The fungus, originating chiefly from branch scars, attacked 12 points of the living sapwood, whence the mycelium subsequently spread to the cambium and the bark causing their ultimate death, but the initial necrosis caused by vigorous growth of the fungus was followed by callusing and weaker growth of the pathogen.

Malt agar gave the most varied cultures of the fungus, isolates from the lower part of the decayed area growing more slowly than those from the upper. Growth

on potato dextrose and Zaleski's agars showed little variation; on the former it was feeble, but on the latter fast, and with abundant surface mycelium.

RIGGENBACH (A.). **Untersuchung über den Eschenkrebs.** [A study on Ash canker.] —*Phytopath. Z.*, 27, 1, pp. 1–40, 26 figs., 4 diags., 10 graphs, 1 map, 1956.

Ash canker has been referred in the relevant literature to *Pseudomonas savastanoi* var. *fraxini* [cf. 11, pp. 12, 682; 22, p. 344], but the author's studies in the canton of Zürich, Switzerland, where the disease is widespread, demonstrated the participation of other organisms, notably *Fusarium lateritium*, *Pleospora herbarum*, and *Plenodomus rabenhorstii*. A cortical discoloration, often reddish, is the first symptom of infection, followed by the development on the stems and branches of pale, mostly elliptical spots, the expansion of which is accompanied by elevation of the centre and its rupture into one or more longitudinal fissures of varying breadth. With further growth new cracks develop and widen, extruding black, suberized tissue. The lacunae of different sizes arising through the dissolution of the cells are occupied by mucilage permeated with bacteria. The lacerated bark round the swollen edges of these open wounds shows a yellowish to reddish discoloration. Four zones may be distinguished in the cankers arising in the manner described, namely, (1) healthy cortex of normal colour over healthy wood; (2) discoloration of the cambium and cortical tissues, slight upward curvature; (3) marked concavity of the cortex with partial detachment from the wood and incipient cracking; and (4) open fissure, cortex lacking, and wood black.

Microscopic examination revealed changes in the anatomical structure of the cortical tissues. The sclerenchyma disappears, with consequent prominence of the parenchyma. The cork layers formed in the course of the disease run roughly parallel with the cambium, separating the infected from the healthy tissue and no doubt representing a defence reaction of the host. The lacunae are thought to arise in part as a mechanical response to the laceration of the tissues under the tension produced by suberization, while bacterial activity is also probably concerned. The cork layers retard but do not prevent the extension of the cankers, near which widening of the annual rings was observed.

P. savastanoi var. *fraxini* secretes in pure culture a toxin inhibiting the growth of *Bacillus subtilis* and causing wilt of tomato shoots, and which can be extracted from the solution by means of various solvents, preferably ethyl acetate. *P. herbarum* also produces a toxin designated pleosporin. In mixed culture with the associated fungi the bacterium affords a marked stimulus to mycelial growth, especially that of *F. lateritium*. The filtrates of mixed cultures of the last named and *P. savastanoi* var. *fraxini* contained a substance inhibiting spore germination in *Ustilago zeae* [*U. maydis*: 32, p. 32] which failed to develop in pure cultures. No mutually antagonistic relationships could be demonstrated between the four micro-organisms, the inoculation of which into potted three- to four-year-old trees in the greenhouse resulted in the formation of much larger cankers than those produced by the bacterium alone.

The optimum temperature for *P.s.* var. *fraxini*, *F. lateritium*, and *P. herbarum* was found to lie between 21° and 24° C., while the much slower growth of *Plenodomus rabenhorstii* was favoured by a higher one (27°).

CHIDDARWAR (P. P.). **A new species of Cercospora on an economic host.**—*Curr. Sci.*, 25, 8, p. 267, 1 fig., 1956.

Cercospora agharkari n.sp. causing severe leaf spot of silver oak (*Grevillea robusta*) at Mahabaleshwar, India, is described. Irregular, necrotic areas resulting in defoliation developed on infected leaves. The conidia of the fungus were 1- to 9-septate, mostly 3- to 6-, and measured 20·4 to 75·5 by 2·1 to 3·4 μ.

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